University of Southampton

Faculty of Environmental and Life Sciences

School of Psychology

The Relationship Between Self-Concept and Paranoia in the General Population

by

Charlotte Davies (MSc, BSc)

Thesis for the degree of Doctorate in Clinical Psychology

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Abstract

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Background: Paranoia is prevalent in children, adolescents, and young adults. We require greater understanding of the factors that are related to paranoia. Chapter one includes a systematic review and meta-analysis to explore the relationship between paranoia and self-concept in children and adolescents. Chapter two includes an empirical study that tested a moderation model, to explore whether the relationship between negative-self and -other beliefs and paranoia is moderated by psychological flexibility. **Method:** The review was preregistered on PROSPRO, CRD42023380191 and PRISMA guidelines were followed to review the articles. For the empirical study a longitudinal design was used, involving participants (n=127) completing questionnaires at two time points: Time 1 (T1; baseline) and Time 2 (T2; 4 weeks later). **Results:** Nine papers (overall 5,538 participants) were included in the review. The meta-analysis found a significant positive relationship, with a medium effect size, between negative self-concept (including positive self-concept reversed) and paranoia ($r = 0.41$, $p < 0.001$). In the empirical study significant relationships, with small to medium effects (r=.205-.523), were reported between negative-self and -other beliefs, paranoia, and psychological flexibility. Cognitive defusion, mindfulness and negative-other beliefs at T1 predicted paranoia at T2. The relationship between negative beliefs about self and others and paranoia was not moderated by psychological (in)flexibility. **Conclusions:** The findings demonstrate significant relationships between cognitive process and paranoia. Future longitudinal and experimental research is needed to establish causality and to identify meditators and moderators of these relationships.

Keywords: Paranoia, Self-beliefs

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Research Thesis: Declaration of Authorship

Print name: Charlotte Davies

Title of thesis: The Relationship Between Self-Concept and Paranoia in the General Population

I declare that this thesis and the work presented in it are my own and has been generated by me as the result of my own original research.

I confirm that:

1. This work was done wholly or mainly while in candidature for a research degree at this University;
2. Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated;
3. Where I have consulted the published work of others, this is always clearly attributed;
4. Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work;
5. I have acknowledged all main sources of help;
6. Where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself;
7. None of this work has been published before submission

Date: 16/05/2024

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Thank you!

Definitions and Abbreviations

Paranoia ..... ‘thinking and feeling like you are being threatened in some way, even if there is no evidence, or very little evidence, that you are.’ (Mind, 2020)

Psychosis ..... ‘Psychosis is when people lose some contact with reality. This might involve seeing or hearing things that other people cannot see or hear (hallucinations) and believing things that are not actually true (delusions). It may also involve confused (disordered) thinking and speaking.’ (NHS, 2023)

Self-Concept ..... ‘Self-concept is the image we have of ourselves. It is influenced by many forces, including our interaction with important people in our lives. It is how we perceive our behaviors, abilities, and unique characteristics.’ (Cherry & Goldman, 2022)

Cherry, K., & Goldman, R. (2022, November). *What is self-concept and how does it form?*. Verywell Mind. https://www.verywellmind.com/what-is-self-concept-2795865

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Chapter 1 Exploring the Relationship between Paranoia and Self-Concept in the Child and Adolescent Population: A Systematic Review and Meta-Analysis

This chapter has been prepared for the submission to the European Child & Adolescent Psychiatry Journal, please see appendix A for journal guidelines.

Exploring the Relationship between Paranoia and Self-Concept in the Child and Adolescent Population: A Systematic Review and Meta-Analysis

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Abstract

Background: Paranoia is prevalent in children and adolescents, yet existing models of psychosis used with this population are based on research with adults. Self-concept is an influential factor in existing models, however the relationship between self-concept and paranoia in the younger population is unclear. A systematic review and meta-analysis was conducted to examine whether there is a relationship between paranoia and self-concept in children and adolescents. **Method:** PRISMA guidelines were followed to review articles exploring the relationship between paranoia and self-concept in participants 6 to 18 years old. The review was preregistered on PROSPRO, CRD42023380191. A meta-analysis, narrative summary and quality assessment were completed. **Results:** Nine papers (overall 5,538 participants) were included in the review. The meta-analysis found a significant positive relationship, with a medium effect size, between negative self-concept (including positive self-concept reversed) and paranoia ($r = 0.41$, $p < 0.001$). Significant relationships were found for paranoia; and self-esteem (positive relationship, medium effect size; $r = -0.38$, $p = 0.001$), and negative self-concept (positive relationship, medium effect size; $r = 0.51$, $p < 0.001$), and positive self-concept (negative relationship, small effect size, $r = -.22$, $p = .03$). Most of the papers (n = 5) were deemed to have moderate quality. **Conclusions:** This review demonstrated a significant relationship between self-concept and paranoia (with the highest effect for negative self-concept) similar to findings from the adult literature, providing support towards models of psychosis. Future longitudinal research is needed to establish causality and to identify meditators and moderators of this relationship.

Keywords: Paranoia, Self-concept, Adolescent, Child

Introduction

Paranoia, the belief that others are intentionally trying to cause harm [1], is common in the adolescent general population, with 20 to 30% of a non-clinical sample of 801 adolescents (aged 11-15) reporting paranoid thoughts at least weekly [2]. Research supports a continuum theory of paranoia [3], whereby paranoia is experienced both in the non-clinical and clinical population, with increased paranoia associated with greater distress and impaired functioning [4]. The findings on the prevalence of paranoia [2] provide further support of this theory in the adolescent general population. The impact of paranoia is significant, and it is widely reported across a range of mental health presentations [5]. However, it is often associated with psychosis due to persecutory delusions (holding beliefs others are trying to cause harm) being a significant feature of this diagnosis [6]. Some of the consequences of experiencing paranoia include reduced social functioning, difficulties working and studying, increased aggression, increased distress, fear, social isolation, poor sleep, increased risk of developing psychosis [7, 89, 10]. The risk of paranoia developing into psychosis is a significant concern as this diagnosis has shown to have detrimental effects for not only the individual but also the system around them [11].

Theoretical models of the development and maintenance of psychosis have been proposed, identifying the centrality of paranoia, and providing direction for appropriate intervention [12, 13]. Additionally, Freeman et al. [14] proposed a specific model for persecutory delusions, supporting a transdiagnostic approach. An influential factor in the development and maintenance of paranoia, identified in the existing adult models of psychosis and persecutory delusions, is negative self-concept. There are different definitions for self-concept, however it can be understood as the beliefs an individual holds about themselves [15]. Self-concept is a multidimensional cognitive schema, which captures how an individual understands themselves, which can differ depending on the context (work, home etc.) and can change over time [15, 16]. Negative self-concept is associated with poor wellbeing [17]; therefore, developing an understanding of the self-concept is important for improving our theoretical understanding of mental health and future implications in clinical practice. Self-concept is an umbrella term for how we perceive ourselves [16, 17] and has been measured with focus on specific dimensions across studies. The complexity of self-concept creates a challenge measuring this concept completely. Therefore, when links are made between self-concept and mental health difficulties, we should consider whether this has captured self-concept or a specific dimension of self-concept. Therefore, to understand the relationship

between self-concept (in its entirety) and paranoia we must bring together studies that have measured this in various ways. Self-concept might be negative, which can be captured by measures such as the Brief Core Schema Scale (BCSS) [19] negative-self subscale with items such as 'I am worthless'. This measure has been used in many studies of psychosis [20] and covers only one aspect of self-concept, core beliefs. Core beliefs are broad and deeply rooted views of the self that are often observed across different areas of a person's life [21]. Furthermore, there are measures specifically for positive self-concept, where a high score reflects a positive self-concept, but a low score does not necessarily reflect a negative self-concept. An example being the BCSS positive-self subscale, with questions such as 'I am valuable'.

Self-esteem is another aspect of self-concept that is captured in measures such as the Rosenberg Self-Esteem Scale (RSES) [22]. In this measure, where an individual evaluates their self-worth and value, scores can range from positive self-concept 'I am able to do things as well as most other people' to negative self-concept 'I feel I do not have much to be proud of'. Therefore, this scale captures the spectrum of self-esteem, from high to average to low. Self-esteem fluctuates and changes over time, whereas core beliefs tend to be embedded and stable across settings [21, 23]. However, although these concepts are distinct, they do relate. For example, a situation like failing an exam may activate a core belief of 'I am worthless', which can result in low self-esteem such as 'I do not feel good about myself, I feel I do not have much to be proud of'. These two dimensions of self-concept have received greater attention in the paranoia literature [18] compared to other aspects of self-concept. Other aspects to consider within self-concept include domain specific measures (e.g., self-concept in different settings), self-image (e.g., perception of physical appearance), self-ideal (e.g., aspirations of who we want to be). A narrative systematic review, exploring the relationship between self-concept and paranoia in adults, was conducted by Tiernan et al. [18]. Ten papers explored this association, with the majority using cross-sectional designs measuring self-esteem. Across all 10 papers, medium positive associations between negative self-concept and paranoia (.36, .41) and weak to medium negative associations between positive self-concept and paranoia (-.17, -.40) were found. These associations remained statistically significant in five when controlling for confounding factors such as depression, gender, age, and IQ. In 2021, a systematic review and meta-analysis examined the relationship between negative schema about the self and others and paranoia in adults [24]. From the 25 papers, a medium positive association between negative self-schema and paranoia was reported (r = 0.46, 95% CI 0.39 to 0.53). However, two associations did not remain significant when controlling for confounding variables such as

depression. Further research has investigated the causal relationship of self-concept on paranoia [25, 26]. A longitudinal cross-lagged structural equation study, including 160 patients with a diagnosis of schizophrenia, found negative self-concept predicted paranoia 12 months later [25]. Experimentally, inducing negative self-concept in non-clinical undergraduate students increased paranoia [26]. Furthermore, interventions for psychosis such as Cognitive Behaviour Therapy for psychosis (CBTp) have yielded reductions in paranoia by targeting the mechanism of negative beliefs about the self [27, 28]. These finding not only provide an understanding of the relationship but identify self-beliefs as an important mechanism involved in maintaining paranoia in adults; however, we cannot assume this extends to other populations, including children and adolescents.

The broader literature, beyond the relationship between paranoia and self-concept, explores further factors that are involved in the maintenance and development of paranoia. For example, attachment and trauma both have been identified as important factors for understanding paranoia, which are also influential in shaping self-concept [29, 30]. The experience of being bullied is a traumatic experience often reported in childhood. Bullying has been associated with paranoia in later life [31] and a cross-sectional mediation identified a relationship between bullying, paranoia, and misappraisal of threat [32]. Furthermore, a meta-analysis reported a significant moderate relationship between both anxious and avoidant attachments and paranoia [33]. A cross-sectional study reported that emotion regulation mediated the relationship between anxious and avoidant attachments and paranoia [34]. Therefore, negative self-concept might be shaped or influenced by bullying and an anxious or avoidant attachment, which creates a sense of threat and mistrust of others, which only further validates a negative self-concept. Paranoia can begin in childhood [35] and the onset of psychosis is often in adolescence [36]. Therefore, understanding the factors involved in the development and maintenance of paranoia at this stage of life is important. For children and adolescents, mechanisms identified include depression, anxiety, peer difficulties, bullying, self-harm, post-traumatic stress disorder, and educational difficulties [37, 38]. Throughout childhood and adolescence, the brain is developing, and individuals go through changes biologically, socially, and psychologically, differing greatly to the experience of an adult [39]. Furthermore, adolescence is a time where greater instability in self-concept is reported [39]. Given the mechanisms identified in the models of psychosis are based on emotional and cognitive processes (including self-concept) we might expect there to be differences for children and adolescence. However, similarities between the factors maintaining paranoia in

adult and young people [2, 12, 13, 14, 40], provide reason to explore pathways identified in adults in the younger population.

Given the significant impact of paranoia on the general and clinical population it is crucial we understand the development and maintenance of paranoia for different demographics. In adults the beliefs individual hold about themselves is important in understanding paranoia, and it is therefore important to review the evidence in young people. Therefore, this systematic review and meta-analysis seeks to address the question, what is the relationship between paranoia and self-concept in children and adolescents? We expected self-concept and paranoia would be related in children and adolescents, and for this relationship to be present across the different domains of self-concept.

Method

Search Strategy

The review was pre-registered on PROSPERO with a start date of August 2022, CRD4202338019. A literature search was last conducted in May 2023 using the following databases: Web of Science Core Collection, MEDLINE, PsycINFO and Scopus. EBSCOhost was used to search for articles within the databases MEDLINE and PsycINFO. The search strategy uses the following search terms: relating to paranoia ('Paranoi* OR Persecut*'), self-concept ('Schema* OR Self-esteem OR Self-representation OR Self-concept OR Self-consciousness OR Belief* OR Self* OR Concept or Representation') and children and adolescents ('Adolescen* OR Teen* OR Youth OR Child*').

Filters were set to only include peer reviewed journals, articles in English, with participants including children/adolescents.

Eligibility Criteria

Inclusion criteria were: (1) Quantitative design, including cross-sectional, experimental, prevalence, cohort, and longitudinal designs; (2) Studies including children and adolescents, six to 18 years old [41, 42]; (3) Populations including non-clinical, at-risk mental state (ARMS)

and clinical diagnosis of psychosis; (4) Published in English; (5) Report statistical analysis of the association between paranoia and self-concept using reliable and valid questionnaires.

The exclusion criteria were: (1) Case studies or qualitative studies; (2) Adults over 18; (3) Articles that focused on a population with diagnoses of intellectual disabilities, physical health difficulties, or mental health difficulties other than psychosis. Samples including the appropriate age but also including ages beyond this criterion were only considered if they separated the age groups in the analysis.

Method of Review

PRISMA guidelines for reporting systematic reviews were followed, see checklist in Appendix B [43]. The data extracted for each article included: the author(s) name and date of publication, sample characteristics (clinical or nonclinical population, number of participants and age), study design, paranoia measure, self-concept measure and main findings. The quality of the papers were assessed using the Effective Public Health Practice Project (EPHPP) Quality Assessment Tool due to its ability to assess studies using a range of designs [44]. Each component rating and global rating are provided in the results. The global quality score was interpreted as strong (determined by no weak component ratings), moderate (determined by one weak component rating) or weak (determined by two or more weak component ratings) [44].

Data extraction and quality checks were completed by CD. Two independent researchers were recruited to review the reliability of the data extraction and quality checks completed by CD. All articles were screened by one researcher and 20% of the articles (k = 114, duplicates removed) were screened by an independent researcher. The independent rater was provided with the eligibility criteria for the review, a random selection of 114 papers screened and a copy of each of these papers. Eleven discrepancies were found in the articles included, this was due to a misunderstanding of the term self-concept as they included papers exploring paranoia and other mental health difficulties. These differences were resolved through consensus discussion once the definition of self-concept was clarified. Additionally, the quality assessment was reviewed by a second independent researcher, they received 20% of the articles (k = 3). The independent rater was provided with the quality assessment tool, the quality assessment dictionary which provides details of how to interpret and rate the papers and a copy of three of paper that were included the review which were randomly selected. Cohen's Kappa was run in SPSS and there was moderate agreement between the two raters, $\kappa = .630$, $p < .001$. Out of the

18 component ratings, five discrepancies were identified which were resolved through consensus discussion.

A three level meta-analysis random effect model was conducted using the Metafor package [45] in R-Studio version 4.3.2 [46]. A three-level model was required due to multiple-effect sizes reported within studies (for example different measures of self-concept used within one study) creating dependencies in the data. The Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC) and Likelihood Ratio Test (LRT) were used to determine whether the three- or two-level model had best fit, explaining more variance. The heterogeneity variance was assessed by the I^2 statistic, which included the percentage of total variance associated with true effect size difference within the samples and true effect size differences between samples [47]. Pearson's *r* was the chosen effect size, which was converted to *z* for the meta-analysis to prevent introducing bias in the estimation of standard error and reverted to *r* for reporting. This was chosen due to the majority of studies reporting Pearson's *r.* Effect sizes were interpreted as small (0.2-0.3), medium (0.4-0.5) and large effect size (>0.8) [48]. Four meta-analyses were conducted. First, examining the overall effect of self-concept and paranoia, positive and negative relationships were included; therefore, negative effects were reverse scored for interpretation. The following three meta-analyses separately examined the relationships between paranoia and i) self-esteem, ii) negative self-concept, and iii) positive self-concept. Publication bias was assessed via visual inspection of a funnel plot.

The narrative synthesis of the findings is reported in supplementary materials. A summary of findings beyond the associations included in the meta-analysis are reported.

Results

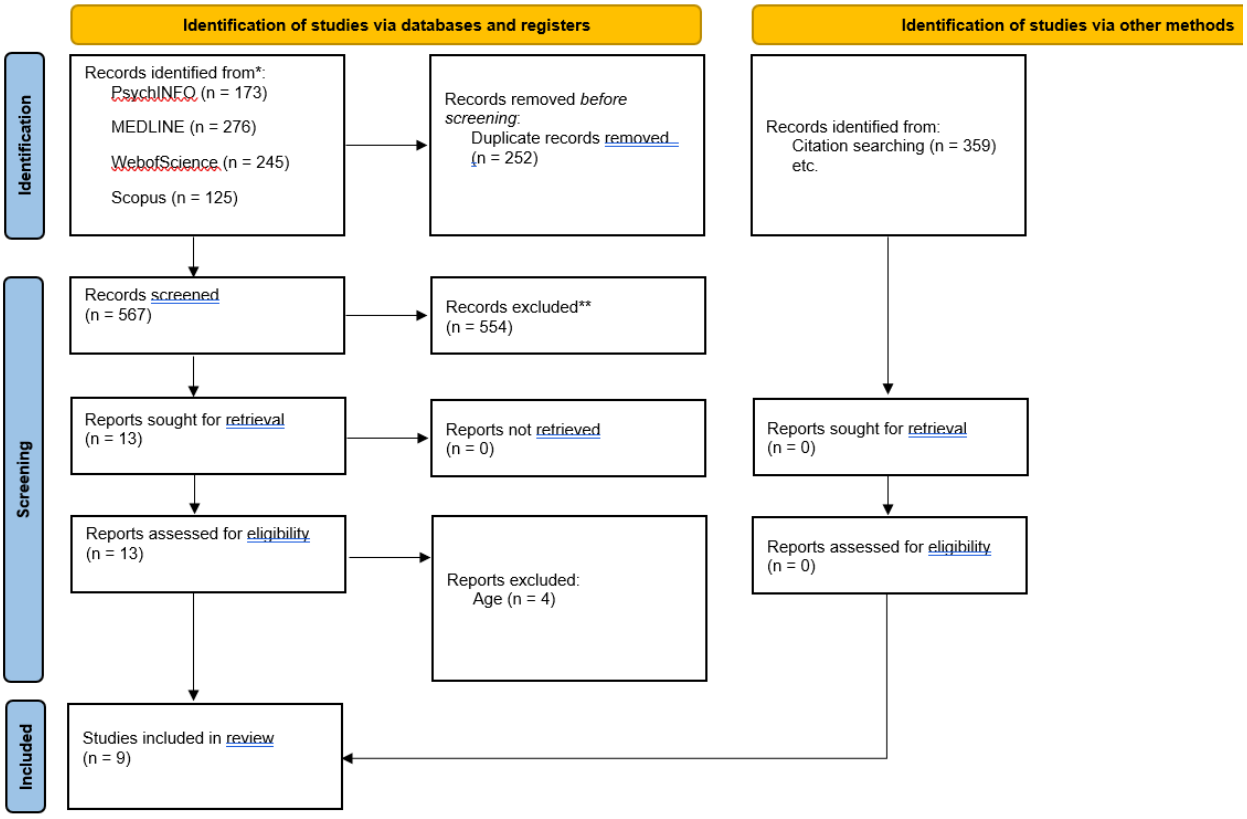
Study Selection and Characteristics

Eight hundred and nineteen studies were identified, and following removal of 252 duplications, 567 were screened. At the final stage of screening, four papers were removed due to not meeting the age criteria [49, 50, 51, 52]. Although they included the population of interest, separate analyses by age were not reported. In total, nine studies were found that met the

inclusion criteria. See Figure 1 for the flow diagram representing the number of studies at each stage of selection for the review.

Figure 1

PRISMA Flow diagram 2020



The study characteristics and findings for the nine studies included in the review are summarised in Table 1.

Table 1

Data Extraction Table

Author(s)	Study Characteristics						Findings	
	Participants			Design	Paranoia measure	Self-concept measure	Correlation	Other (e.g., regression)
	Clinical/ Non-clinical	Number	Age (mean, standard deviation)					
Bird et al. [40]	Clinical	34 baseline 33 follow-up	11-16 years old (*m* = 14.9, *SD* = 1.25)	Longitudinal	GPTS	BCSS negative-self subscale & RSES	BCSS baseline $r = 0.51$, $p < 0.002$** RSES baseline $r = -0.46$, $p < 0.007$**	BCSS follow up $r = 0.57$, $p < 0.001$** RSES follow up $r = -0.43$, $p < 0.012$**
Campbell & Morrison [53]	Non-clinical	373	14-16 years old (*m* = 14.8, *SD* = 0.7)	Cross-Sectional	PS	PTCI negative beliefs about the self & self-blaming beliefs subscales	Negative self-beliefs $r = .62$, $p < 0.01$** Self-blaming beliefs $r = .46$, $p < 0.01$**	Negative self-beliefs $\beta = .33$, $p < .0005$.
Carvalho et al. [54]	Non-clinical	1,657	14-18 years old (*m* = 16.47,	Cross-Sectional	PS Portuguese version	FSCRS	Self-criticism: Persecutory ideas $r = .54$, $p < .001$** Mistrust feelings	Self-Criticism: Persecutory ideation $\beta = .207$, $p < .001$ Mistrust feelings

			SD = 1.04)				*r* = .39, *p* < .001** Reassured self: Persecutory ideas *r* = -.29, *p* < .01* Mistrust feelings *r* = -.14, *p* < .01	β = .132, *p* < .001
Galbraith et al. [55]	Non-clinical	392	11-16 years old (*m* = 13.03, *SD* = 1.41)	Cross-Sectional	CAPE paranoia subscale	BCSS	Negative self *r* = 0.55, *p* < .01** Positive self *r* = -0.32, *p* < .01*	Negative self β = 0.04, *p* = reported as non-significant Positive self β = 0.00, *p* = reported as non-significant
Garaigordobil [56]	Non-clinical	286	14-16 years old (*m* = 14.72, *SD* = 0.75)	Cross-Sectional	SCL-90-R	RSES		total effect β = -1.47, *p* = .001, partial effect β = -1.14, *p* < .001
Gin et al. [57]	Clinical	122	12-18 years old (*m* = 14.81, *SD* = 1.62)	Cross-Sectional	UEQ	BCSS	Negative self *r* = 0.26, *p* < .01* Positive self *r* = -0.06, *p* > .05	Negative self β = -0.135, *p* < .001 Positive self β = -0.021, *p* = .320
Kingston et al. [58]	Non-clinical (same sample as Parker & Kingston [49]	296 baseline 133 follow-up	14-16 years old (*m* = 14.71, *SD* = 0.53)	Longitudinal	B-CAP	RSES		β = 0.65, *p* < 0.001

Parker & Kingston [59]	Non-clinical	90	14-16 years old (*m* = 14.5, *SD* = 0.52)	Randomised Control Trial	PS	RSES	r = -.23, p = .031*	$F_{(2,112)}$ = 2.86, p = .06
Wong et al. [60]	Non-clinical	873 UK &1282 Hong Kong (HK)	8-14 years old (*m* = 11.37, *SD* = 1.66)	Cross-Sectional	SMS	RSES	UK r = -.42, p < .001 HK r = -.37, p <.001	General mistrust (UK) OR = 2.47, p < .01 (HK) OR = 3.76, p < .001 Home mistrust (UK) OR = 2.16, p < .05 (HK) OR = 1.58, p = .07 School mistrust (UK) OR = 2.86, p < .001 (HK) OR = 2.49, p < .001

Note. Bird Checklist of Adolescent Paranoia (B-CAP); Brief Core Schema Scales (BCSS); Community Assessment of Psychic Experiences (CAPE); Forms of Self-Criticising/Attacking and Self-Reassurance Scale (FSCRS); Green et al. Paranoid Thoughts Scale (GPTS); Paranoia Scale (PS); Post-traumatic Cognitions Inventory (PTCI); Rosenberg Self-Esteem Scale (RSES); Social Mistrust Scale (SMS); Symptoms Checklist-90-Revised (SCL-90-R); Unusual Experience Questionnaire (UEQ). Significant association with small effect size (0.2-0.3) *, medium effect size (0.4-0.5) **, large effect size (>0.8) ***.

Across the studies there were 5,538 participants, with sample sizes ranging between 34 and 1657. The age range for the studies were between eight to 18 years old (M = 14.4, SD = 1.05). Two studies used clinical samples [40, 57] and six were non-clinical. Four samples were predominately female [40, 55, 57, 59], four demonstrated an even ratio between female and males [53, 54, 56, 58] and two samples within one paper did not report gender [60]. Gender categories other than 'female' and 'male' were reported in none of the samples. The majority of participants were White British in four samples [40, 57, 58, 59], one sample reported the majority of participants were Chinese [60], four samples did not report ethnicity [53, 54, 55, 56].

Six studies were cross sectional, two longitudinal and one a randomised control trial (RCT). Various measures were used for paranoia; Bird Checklist of Adolescent Paranoia (B-CAP; k = 1), Community Assessment of Psychic Experiences (CAPE; k = 1), Green et al. Paranoid Thoughts Scale (GPTS; k = 1), Paranoia Scale (PS; k = 3), Social Mistrust Scale (SMS; k = 1), Symptoms Checklist-90-Revised (SCL-90-R; k = 1), Unusual Experience Questionnaire (UEQ; k = 1). Measuring self-concept; BCSS (k = 3), Forms of Self-Criticising/Attacking and Self-Reassurance Scale (FSCRS; k = 1), Post-traumatic Cognitions Inventory (PTCI, retained as includes a subscale of beliefs about self; k = 1) and the RSES (k = 5). The countries where studies were conducted included the UK (k = 7), Portugal (k = 1), Hong Kong (k = 1) and Spain (k = 1).

Main Findings

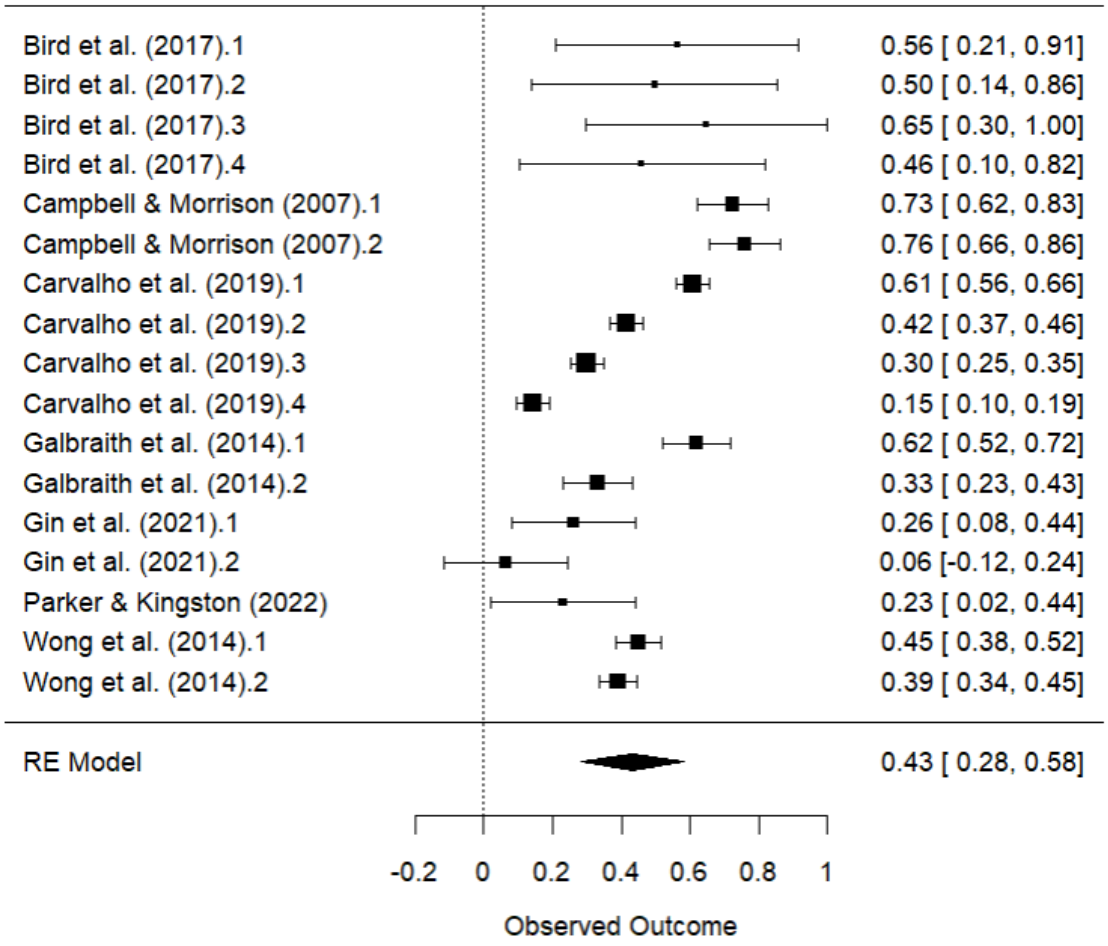
What is the relationship between paranoia and self-concept?

Paranoia and self-concept were examined in seven samples (17 effect sizes, n = 4,924) and findings from the three-level meta-analysis indicated they were significantly positively associated with a medium effect size, r = 0.41 (95% Confidence Interval [CI] = 0.28, 0.52; p < 0.001). This suggests there is a substantial association between paranoia and self-concept; therefore, high levels of negative self-concept are related to high levels of paranoia and high levels of positive self-concept are related to low levels of paranoia and vice versa. I^2 was 96.16%, with estimated variance components $\tau 2$ Level 3 = 48.31 and $\tau 2$ Level 2 = 47.85, meaning that I^2 Level 3 = 48.3% of the total variation could be attributed to between-study, and I^2 Level 2 = 47.9% to within-study heterogeneity. The three-level model did not provide a significantly better fit compared to a two-level model χ^2_1= 1.78, p= 0.182, AIC and BIC were higher for the three-level model. The LRT comparing models with and without between-study

variance (level 3) did not show significant variance between the effect sizes within studies (level 2), indicating a non-heterogeneous effect size distribution. However, a three-level model was retained due to the same sample providing multiple effect sizes introducing dependencies in the data. See Figure 2 for a forest plot for the three-level model.

Figure 2

Meta-analysis of Self-Concept and Paranoia Forest Plot



Note. Negative effect sizes were reversed to interpret positive and negative self-concept together. RE Model – Random Effects Model (average effect).

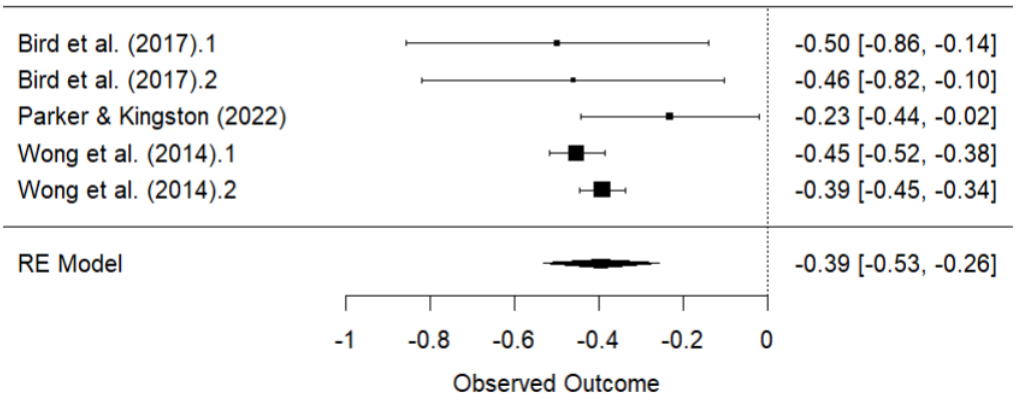
There were too few studies to undertake statistical comparisons within the studies, including the specific measures of self-concept (e.g., RSES, BCSS) and paranoia (e.g. PS) or positive and negative self-concept [60].

What is the relationship between paranoia and self-esteem?

Five studies examined the relationship between paranoia and self-esteem, all using the RSES [40, 56, 58, 59, 60]. In the meta-analysis random-effects model paranoia and self-esteem were examined in 3 samples (5 effect sizes, n = 2,279) and were significantly negatively associated with a medium effect size, r = -0.38 (95%CI = -0.25, -0.49; p = 0.001). This suggests there is a substantial association between paranoia and self-esteem; therefore, high levels of negative self-esteem are related to high levels of paranoia and high levels of positive self-esteem are related to low levels of paranoia and vice versa. I^2 was 51.29%, with estimated variance components $\tau 2$ Level 3 = 39.56 and $\tau 2$ Level 2 = 11.73, meaning that I^2 Level 3=40% of the total variation could be attributed to between-study, and I^2 Level 2=11.7% to within-study heterogeneity. The three-level model did not provide a significantly better fit compared to a two-level model χ^2_1 = -.07, p = 0.787, AIC and BIC were higher for the three-level model. The LRT comparing models with and without between-study variance (level 3) did not show significant variance between the effect sizes within studies (level 2), indicating a non-heterogeneous effect size distribution. A three-level model was retained due to the same sample providing multiple effect sizes introducing dependencies in the data. See Figure 3 for a forest plot for the three-level model.

Figure 3

Meta-analysis of Self-Esteem and Paranoia Forest Plot



Note. RE Model – Random Effects Model (average effect).

The study by Bird et al. [40] used a longitudinal design where the strength of the relationship between paranoia and self-esteem remained medium at follow-up, indicating low self-esteem can predict paranoia persistence. One longitudinal mediation study considered whether self-esteem was a mediating factor for the relationship between paranoia and

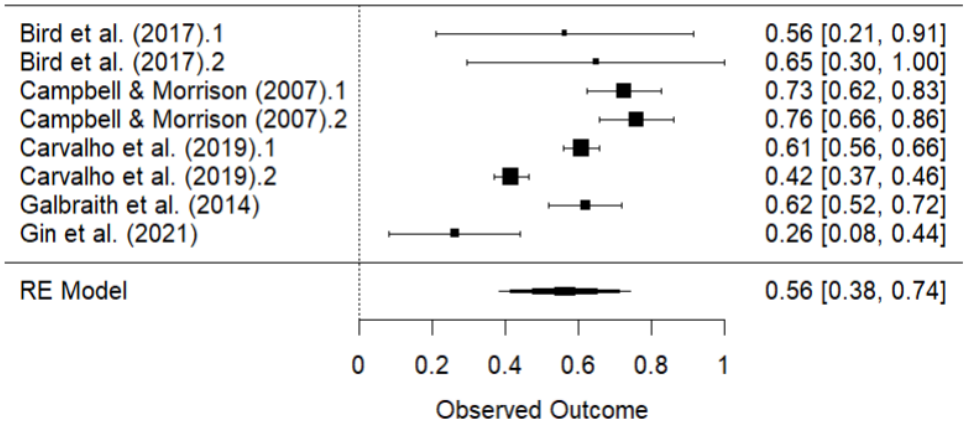
wellbeing [58]. They found that paranoia reduced wellbeing through negative self-esteem. Finally, an RCT by Parker and Kingston [59] found paranoia reduced following a values-based intervention. However, there was not a significant difference in self-esteem between the intervention group and control group over time.

What is the relationship between paranoia and negative self-concept?

Five studies examined the relationship between paranoia and negative self-concept, measured by the FSCRS (self-criticism subscale), BCSS (negative-self subscale) and the PTCI (negative-self and self-blaming subscales) [40, 53, 54, 55, 57]. In the meta-analysis paranoia and negative self-concept associations were examined in 5 samples (8 effect sizes, n = 2,578) and were significantly positively associated with a medium effect size, r = 0.51 (95%CI = 0.36, 0.63; $p < 0.001$). This suggests there is a substantial association between paranoia and negative self-concept; therefore, high levels of negative self-concept are related to higher levels of paranoia and low levels of negative self-concept are related to lower levels of paranoia and vice versa. I^2 was 92.83%, with estimated variance components $\tau 2$ Level 3 = 61.19 and $\tau 2$ Level 2 = 31.64, meaning that I^2 Level 3= 61.2% of the total variation could be attributed to between-study, and I^2 Level 2=31.6% to within-study heterogeneity. The three-level model did not provide a significantly better fit compared to a two-level model $\chi^2_1 = 0.90$, $p = 0.342$, AIC and BIC were higher for the three-level model. The LRT comparing models with and without between-study variance (level 3) did not show significant variance between the effect sizes within studies (level 2), indicating a non-heterogeneous effect size distribution. A three-level model was retained due to the same sample providing multiple effect sizes introducing dependencies in the data. See Figure 4 for a forest plot for the three-level model.

Figure 4

Meta-analysis of Negative Self-Concept and Paranoia Forest Plot



Note. RE Model – Random Effects Model (average effect).

The strength of the association between paranoia and negative self-concept remained at follow-up three months later in the Bird et al. [40] study, indicating negative self-concept can predict paranoia persistence. The study by Gin et al. [60] developed a model to test the associations between components of the adult cognitive model of psychosis including negative self-beliefs. They found these beliefs contributed significantly to paranoia (β =0.14, p<.05). Furthermore, Galbraith et al. [55] considered whether negative core beliefs was a mediating factor for paranoia and hallucinations, but this was not found. Regression analysis was conducted by Campbell and Morrison [53] and Carvalho et al. [54] indicating self-criticism and negative self-beliefs predicted paranoia.

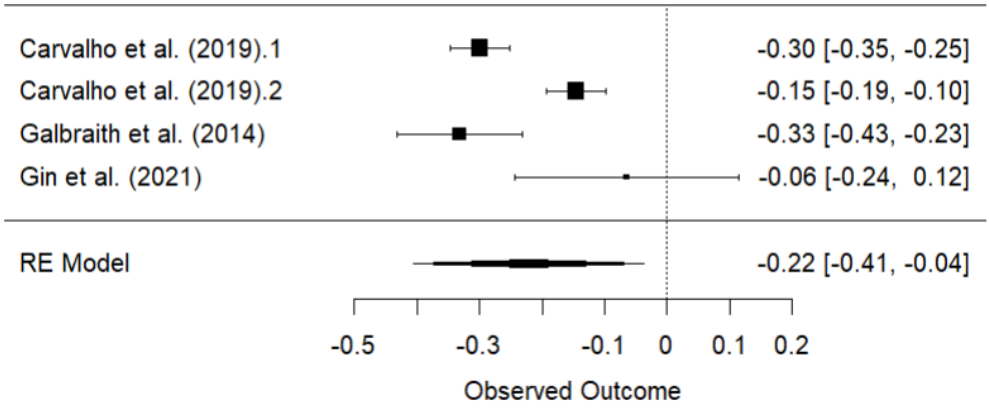
What is the relationship between paranoia and positive self-concept?

Five studies examined the relationship between paranoia and positive self-concept, measured by the BCSS (positive subscale) and the FSCRS (self-reassurance subscale) [54, 55, 57]. In the meta-analysis paranoia and positive self-concept associations were examined in 3 samples (4 effect sizes, n = 2,171) and were significantly negatively associated with a small effect size, r = -.22 (95%CI = -0.41, -0.04; p = .031). This suggests there is an association between paranoia and positive self-concept; therefore, high levels of positive self-concept are related to lower levels of paranoia and low levels of positive self-concept are related to higher levels of paranoia. I^2 was 89.55%, with estimated variance components $\tau 2$ Level 3 = 6.78 and $\tau 2$ Level 2 = 8.95, meaning that I^2 Level 3 = 7% of the total variation could be attributed to between-study,

and I^2 Level 2 = 9% to within-study heterogeneity. The three-level model did not provide a significantly better fit compared to a two-level model $\chi^2_1 < .000$, $p = 1$, AIC and BIC were higher for the three-level model. The LRT comparing models with and without between-study variance (level 3) did not show significant variance between the effect sizes within studies (level 2), indicating a non-heterogeneous effect size distribution. A three-level model was retained due to the same sample providing multiple effect sizes introducing dependencies in the data. See Figure 5 for a forest plot for the three-level model.

Figure 5

Meta-analysis of Positive Self-Concept and Paranoia Forest Plot



Note. RE Model – Random Effects Model (average effect).

Quality Assessment of Studies

Quality ratings, using the EPHPP [44], are summarised in Table 2.

Table 2

EPHPP Quality Assessment Table

Author(s)	Component Ratings						Global Rating
	Selection Bias	Study Design	Confounders	Blinding	Data collection methods	Withdraws and Drop-Outs	
Bird et al. [40]	2 (moderate)	2 (moderate)	1 (strong)	2 (moderate)	3 (weak)	1 (strong)	Moderate
Campbell & Morrison [53]	2 (moderate)	3 (weak)	3 (weak)	2 (moderate)	1 (strong)	N/A	Weak
Carvalho et al. [54]	1 (strong)	3 (weak)	1 (strong)	2 (moderate)	2 (moderate)	N/A	Moderate
Galbraith et al. [55]	2 (moderate)	3 (weak)	1 (strong)	2 (moderate)	1 (strong)	N/A	Moderate
Garaigordobil [56]	2 (moderate)	3 (weak)	1 (strong)	2 (moderate)	1 (strong)	N/A	Moderate
Gin et al. [57]	2 (moderate)	3 (weak)	1 (strong)	2 (moderate)	3 (moderate)	N/A	Moderate
Kingston et al. [58]	2 (moderate)	2 (moderate)	3 (weak)	2 (moderate)	1 (strong)	3 (weak)	Weak
Parker & Kingston [59]	1 (strong)	1 (strong)	1 (strong)	2 (moderate)	1 (strong)	2 (moderate)	Strong
Wong et al. [60]	1 (strong)	3 (weak)	1 (strong)	2 (moderate)	1 (strong)	N/A	Moderate

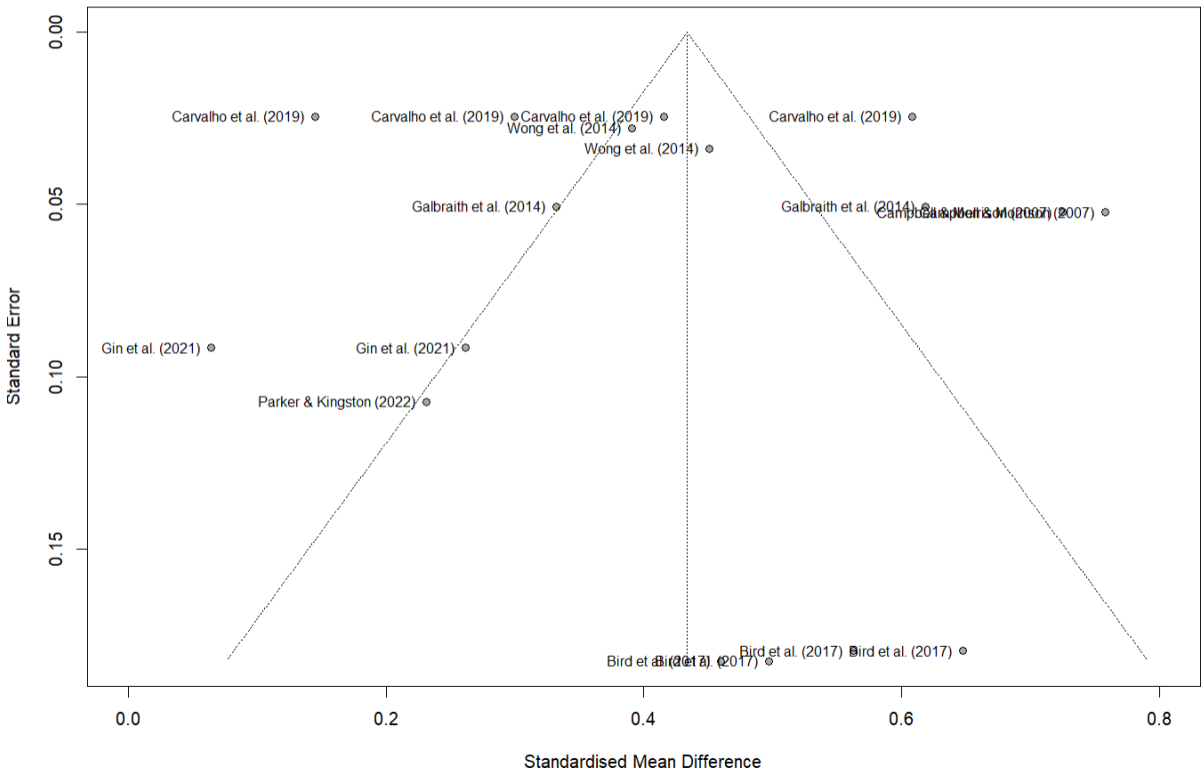
Note. Studies that had two component ratings of 'weak' received a global rating of 'weak', those that had one component rating of 'weak' received a global rating of 'moderate' and those with no 'weak' component rating received a global rating of 'strong'.

Two studies were rated as weak [53, 58], f six were moderate [40, 54, 55, 56, 57, 60] and one was rated as strong [59]. Selection bias refers to whether the sample was representative of the target population and all the studies indicated at least a moderate level of random selection. The majority of studies were reported to have a weak study design due to these being cross-sectional and for this reason drop-outs was not applicable for many. For two studies [53, 58], it was unclear if they controlled for any confounding variables as this was not addressed therefore providing a low score. However, for most studies it was unclear whether participants were aware of the research question resulting in moderate scores. For the data collection methods most studies reported to use valid and reliable measures, for three of these studies reliability was not reported. The validity of these measures within the current samples were reported in seven studies. Although the UEQ was not validated within the current sample, it has been validated within other adolescent studies [61]. However, the GPTS has not been validated within an adolescent sample and therefore received a weak rating. The quality assessment indicated the literature in this area to be robust, with the majority of studies identified to have strong to moderate quality.

Publication bias was reviewed by a Funnel Plot, see Figure 6.

Figure 6

Funnel Plot of Self-Concept and Paranoia



The funnel plot shows a symmetrical pattern that does not suggest publication bias. This is further supported by Egger's test, 1.19 [95% CI -2.86, 5.23] $t = 0.58$, $p = 0.574$, which does not indicate the presence of funnel plot asymmetry.

Discussion

The aim of this systematic review and meta-analysis was to quantify the relationship between paranoia and self-concept in children and adolescents. Overall, the meta-analysis on the relationship between paranoia and self-concept, found paranoia was significantly negatively associated with positive self-concept (including negative self-concept reverse scored to be measured alongside positive self-concept), with a medium effect size. This suggests that young people who experience high levels of paranoia, also have a negative self-concept and vice versa. Three additional meta-analyses reported summary effects for the relationship between paranoia with self-esteem, negative self-concept, and positive self-concept. It was found that paranoia was most strongly statistically positively related to negative self-concept (such as negative core beliefs), followed by low self-esteem with a positive relationship, with the lowest strength for the negative relationship with positive self-concept. From the nine papers reviewed, all reported a significant positive relationship between negative self-concept and paranoia in young people. Four papers (7 effects) reported a medium relationship, however two studies [57, 59] found the strength of this relationship to be small. The two studies with small effects had moderate to strong quality ratings, and they differed from each other in measure, population, and design providing little direction as to the differences in these samples compared to the other stronger effects. Additionally, moderate quality ratings were provided for the studies with medium effects, suggesting the quality does not explain the difference. However, in the adult meta-analysis exploring negative self-concept and paranoia, they identified differences in effects based on the measures used [24]. Both of the studies with small effects differed to the other studies due to the combination of measures used, with one being the only study to use the UEQ [57] and the other being the only study to use the PS and the RSES together.

The effect sizes in this review are comparable to the ones reported in the adult systematic narrative synthesis, with both reporting paranoia is associated more with negative self-concept, with weak to medium effects [18]. Additionally, the results from the meta-analysis in this review with young people suggest the relationship between negative self-concept and paranoia is similar to adults, with a significant positive relationship with medium effects for both adults (r =

0.46) [24] and young people (r = 0.51; identified by the current review). The narrative synthesis also highlighted some key findings suggesting that persistence of paranoia can be predicted by low self-esteem [40] and paranoia reduces self-esteem which reduces wellbeing [58]. Although Gin et al. [57] only found a small significant relationship between the variables, the regression analysis suggested negative self-beliefs predicted paranoia. Collectively, these findings highlight the importance of self-concept in maintaining paranoia and the impact on wellbeing. However, values-based tasks may reduce paranoia but does not significantly reduce negative self-concept over time [59].

It is important to consider the theoretic and clinical implications of this review. Regarding theory, we have found a relationship between paranoia and self-concept in adolescence. The effect size of this relationship was medium for self-concept and specifically for negative self-concept. These findings predominantly represent an adolescent population and we do not have the evidence to extend this to children. The adult literature identifies a strong positive relationship between negative self-concept and paranoia, but mixed evidence for the relationship between positive self-concept and paranoia [18]. The findings within this review found a similar pattern to the adult literature providing more data (8 effects) and stronger associations (r = 0.51) for the relationship between negative self-concept and paranoia, compared to positive self-concept (4 effects, r = -.22). The importance of self-concept as a factor related to paranoia is highlighted when we consider the effect size of this relationship is similar to established maintenance factors of paranoia in adults. The current findings are in line with the broader literature, identifying attachment and trauma as putative mediators for paranoia [31, 32, 33, 34], given their relationship to both self-concept and paranoia. Future consideration to how all these variables relate will provide depth to understanding the maintenance and developmental factors of paranoia. Further exploration through experimental designs is required before we can fully understand how adolescent paranoia is maintained and how this compares to the established adult models of psychosis. Given the majority of the literature to date is with nonclinical samples and using cross-sectional designs, clinical implications are considered tentative. Nonetheless, the findings suggest that it is important to assess self-concept in adolescents with the potential to incorporate this in psychological formulations. Further research is essential to inform the clinical changes that may be required for this population. This review has a number of strengths. The review was undertaken robustly, as it was pre-registered and independent assessment was undertaken of both the screening and quality assessment. The review captured studies using both children and adolescents, including clinical and non-clinical populations and a range of study designs. The findings synthesised evidence of different elements of self-concept, including high and low self-esteem, negative self-beliefs, positive self-beliefs, self-criticism, and self-reassurance and synthesised

effects using meta-analysis. The review provided a degree of cross-cultural representation, including populations in the UK, Hong Kong, Portugal, and Spain. Furthermore, the majority of studies were rated to have moderate quality, with no clear evidence of publication bias.

It is important to consider the limitations of the review. The quality of several papers was impacted by the design. The cross-sectional design was the most popular method used, but this limits the ability to infer causality, such that it is unknown whether paranoia causes reductions in self-concept or whether negative self-concept causes paranoia or both. Although two longitudinal designs were included in the review, one was observational just demonstrating the stability of self-esteem and paranoia over time. The other longitudinal design identified a pathway from paranoia to negative self-esteem; however, the study quality was rated weak and only explored self-esteem. Due to the number of retained papers, the comparisons within the meta-analysis were limited. Comparison of the effect size of paranoia and self-concept based on the paranoia measure used, would provide indication of differences between these measures; however, most studies measured this differently, therefore grouping measures to compare was not possible. Furthermore, seeking papers on self-concept required an inclusive search given the variability in how this term is conceptualised differently with researchers. Self-concept is a consistently changing multidimensional construct that is complex and due to this complexity has received challenge and critique in how it is measured [16]. The context of the environment influences self-concept and the subtle changes may not be detected in one-time measurements of individuals experiences over a specified period. In this review, dimensions identified to fall within self-concept have been synthesised; however, these measures do not encompass all the aspects and diversity of self-concept. Although attempts to understand this construct have been addressed, further developments are required in the measurement and understanding of self-concept. The focus of the current review was exclusively on psychosis and focusing more broadly on mental health difficulties would have provided a broader overview of the literature. A further limitation is that studies predominantly sampled adolescents and only one study included participants as young as eight years old [59], and the findings from this study were not reported separately for children and adolescents. It is therefore currently unclear whether findings generalise to children.

The findings from the current review highlight several important areas for future research. First, additional longitudinal studies are required to further examine the stability of the relationship between paranoia and self-concept, perhaps particularly using experience sample methodology to observe variables on multiple occasions over time. Conducting longitudinal mediation and moderation analyses would also inform our understanding of factors that might explain the relationship (and therefore might be targets for interventions), as well as those that might attenuate it, such as anxiety, low mood, and interpretation bias. Furthermore,

experimental designs could be used to manipulate variables and assess causality. For example, researchers could experimentally manipulate self-esteem to look at the effect on paranoia; or vice versa, inducing paranoia to look at effects on self-esteem to test this bi-directionally. These studies should attempt to increase generalisability, including younger age groups, different ethnicities, and gender identities. Additionally, it is recognised that paranoia is a transdiagnostic concept, whereas the current review focused specifically on the clinical presentation of psychosis. Future reviews in this area might consider other presentations to reflect the broader literature.

Conclusion

The findings from the current review suggest that there is a relationship between adolescent self-concept and paranoia, indicating that young people with strong paranoid beliefs hold strong negative self-concept beliefs and vice versa. The relationship between positive self-concept and paranoia held less strength and received reduced focus in the literature. Finally, a significant negative relationship between high self-esteem and paranoia was reported, but with a lower effect compared to negative self-beliefs. Overall, the findings suggest that self-concept is important in paranoia, providing initial support for the applicability of adult models of psychosis for adolescents. Future research, using experimental and longitudinal designs, and including samples of younger adolescents and children, is needed to identify mediators and moderators of the relationship between paranoia and self-concept.

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Appendix

Appendix A - European Child & Adolescent Psychiatry Submission Guidelines

Submission guidelines

Contents

Editing Services

Open access publishing

Mistakes to avoid during manuscript preparation

Instructions for Authors

Types of Papers

● Accepted article types: Original Contribution, Review Article, Letter to the Editors

● Original Articles should not exceed 6,000 words (including abstract and keywords, tables, captions and references). Review Articles should not exceed 12,000 words (including abstract and keywords, tables, captions and references). Exceptions can be made with the agreement of the Editor-in-Chief.

The word count is to be stated on the title page of the manuscript.

Original Contributions should be formatted as follows: Introduction, Methods, Results and Discussion.

● Letters to the Editors should either comment on a recently published article or contribute to an ongoing relevant discussion of general interest to our readership. We kindly ask to limit the number of authors to no more than 10. The text should not exceed more than 1,500 words (one figure and/or one table allowed within word count); the number of references should not exceed 10. Abstract and keywords are not required. Letters are subject to editorial review and will be peer-reviewed. When a submitted letter refers to an article published in a previous issue of the journal, the letter is sent to the respective authors, who may be offered a chance to comment in a separate letter.

Specific requirements for submission of clinical trials:

1) pre-registration with appropriate clinical trial registry;

2) adherence to CONSORT Statement strongly recommended.

ECAP is actively encouraging the submission of meta-analyses and clinical genetic case reports/case series with a psychiatric focus:

Meta-analyses:

Systematic reviews and meta-analyses are the gold standard of synthesizing available empirical evidence. To boost publications in this area we have appointed Dr. Julian Koenig as a special

topic editor to handle systematic reviews and meta-analyses. These may pertain to treatment trials but may also extend to non-treatment related findings, including epidemiological studies, or observational (cross-sectional or longitudinal) studies reporting on associations with relevance to the field of child and adolescent psychiatry. We strongly recommend registration of the review/meta-analysis (see PROSPERO). Reporting should follow the most recent 2020 PRISMA guidelines (www.prisma-statement.org). Authors should include a paragraph highlighting the clinical relevance and implications of their systematic review or meta-analysis.

Clinical genetics:

ECAP perceives the need to improve the psychological and psychiatric assessment of children and adolescents with rare genetic disorders. To boost research in this context of clinical genetics, *ECAP* established a new category for case reports/series of rare genetic disorders with a psychiatric phenotype. Dr. Franziska Degenhardt, a board-certified clinical geneticist and child and adolescent psychiatrist in training, is the responsible editor. The published case reports/series will focus on the mental phenotype of patients with a rare genetic disorder. It needs to include solid data on the mental phenotype based on at least one unpublished patient in combination with a brief review (if available) of all published patient case reports. The synopsis of the respective mental/psychopathological/behavioural phenotype of all published case reports or case series must be presented in a table.

Please also make sure to point out your contribution to this field by addressing how you sought to overcome simplistic assessments. Make sure that you have made use of appropriate self-, parental and/or clinician/expert rating scales and instruments. Your discussion should include a paragraph on the current knowledge of central nervous system implications of the respective genetic finding; please delineate what your study adds to this knowledge (both in terms of mental phenotype and other bio-medically relevant issues such as e.g. disordered sleep or appetite). In addition, we welcome suggestions in the discussion as to how to improve phenotyping of the respective disorder/phenotype, so that other researchers can build on your work.

ECAP will allow for the submission of a total of 15 such original articles which should not exceed 3,500 words (submission of supplementary material is possible) excluding figures, tables and references. A maximum of two figures and three tables are allowed (excluding supplementary material). Please submit your study by referring to „Case reports/series of rare genetic disorders“. We will evaluate the impact of this special topic to decide whether to maintain it beyond the first 15 studies.

We look forward to your contribution.

Manuscript Checklist (Download pdf, 271 kB)

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Editorial procedure

Single-blind peer review

This journal follows a single-blind reviewing procedure.

This journal also publishes special/guest-edited issues. The peer review process for these articles is the same as the peer review process of the journal in general.

Additionally, if a guest editor authors an article in their issue/collection, they will not handle the peer review process.

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Manuscript Submission

Manuscript Submission

Submission of a manuscript implies: that the work described has not been published before; that it is not under consideration for publication anywhere else; that its publication has been approved by all co-authors, if any, as well as by the responsible authorities – tacitly or explicitly – at the institute where the work has been carried out. The publisher will not be held legally responsible should there be any claims for compensation.

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Please follow the hyperlink “Submit manuscript” and upload all of your manuscript files following the instructions given on the screen.

Source Files

Please ensure you provide all relevant editable source files at every submission and revision. Failing to submit a complete set of editable source files will result in your article not being considered for review. For your manuscript text please always submit in common word processing formats such as .docx or LaTeX.

Submitting Declarations

Please note that Author Contribution information and Competing Interest information must be provided at submission via the submission interface. Only the information submitted via the interface will be used in the final published version. Please make sure that if you are an editorial board member and also a listed author that you also declare this information in the Competing Interest section of the interface.

Please see the relevant sections in the submission guidelines for further information on these statements as well as possible other mandatory statements.

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Title Page

Please make sure your title page contains the following information.

Title

The title should be concise and informative.

Author information

The name(s) of the author(s)

The affiliation(s) of the author(s), i.e. institution, (department), city, (state), country

A clear indication and an active e-mail address of the corresponding author

If available, the 16-digit ORCID of the author(s)

If address information is provided with the affiliation(s) it will also be published.

For authors that are (temporarily) unaffiliated we will only capture their city and country of residence, not their e-mail address unless specifically requested.

Large Language Models (LLMs), such as ChatGPT, do not currently satisfy our authorship criteria. Notably an attribution of authorship carries with it accountability for the work, which cannot be effectively applied to LLMs. Use of an LLM should be properly documented in the

Methods section (and if a Methods section is not available, in a suitable alternative part) of the manuscript.

Abstract

Please provide an abstract of 150 to 250 words. The abstract should not contain any undefined abbreviations or unspecified references.

For life science journals only (when applicable)

Trial registration number and date of registration for prospectively registered trials

Trial registration number and date of registration, followed by “retrospectively registered”, for retrospectively registered trials

Keywords

Please provide 4 to 6 keywords which can be used for indexing purposes.

Statements and Declarations

The following statements should be included under the heading "Statements and Declarations" for inclusion in the published paper. Please note that submissions that do not include relevant declarations will be returned as incomplete.

Competing Interests: Authors are required to disclose financial or non-financial interests that are directly or indirectly related to the work submitted for publication. Please refer to “Competing Interests and Funding” below for more information on how to complete this section.

Please see the relevant sections in the submission guidelines for further information as well as various examples of wording. Please revise/customize the sample statements according to your own needs.

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Text

Text Formatting

Manuscripts should be submitted in Word.

Use a normal, plain font (e.g., 10-point Times Roman) for text.

Use italics for emphasis.

Use the automatic page numbering function to number the pages.

Do not use field functions.

Use tab stops or other commands for indents, not the space bar.

Use the table function, not spreadsheets, to make tables.

Use the equation editor or MathType for equations.

Save your file in docx format (Word 2007 or higher) or doc format (older Word versions).

Manuscripts with mathematical content can also be submitted in LaTeX. We recommend using Springer Nature's LaTeX template.

Headings

Please use no more than three levels of displayed headings.

Abbreviations

Abbreviations should be defined at first mention and used consistently thereafter.

Footnotes

Footnotes can be used to give additional information, which may include the citation of a reference included in the reference list. They should not consist solely of a reference citation, and they should never include the bibliographic details of a reference. They should also not contain any figures or tables.

Footnotes to the text are numbered consecutively; those to tables should be indicated by superscript lower-case letters (or asterisks for significance values and other statistical data). Footnotes to the title or the authors of the article are not given reference symbols.

Always use footnotes instead of endnotes.

Acknowledgments

Acknowledgments of people, grants, funds, etc. should be placed in a separate section on the title page. The names of funding organizations should be written in full.

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Scientific style

Please always use internationally accepted signs and symbols for units (SI units).

Generic names of drugs and pesticides are preferred; if trade names are used, the generic name should be given at first mention.

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References

Citation

Reference citations in the text should be identified by numbers in square brackets. Some examples:

1. Negotiation research spans many disciplines [3].

2. This result was later contradicted by Becker and Seligman [5].

3. This effect has been widely studied [1-3, 7].

Reference list

The list of references should only include works that are cited in the text and that have been published or accepted for publication. Personal communications and unpublished works should only be mentioned in the text.

The entries in the list should be numbered consecutively.

If available, please always include DOIs as full DOI links in your reference list (e.g. “https://doi.org/abc”).

Journal article

Gamelin FX, Baquet G, Berthoin S, Thevenet D, Nourry C, Nottin S, Bosquet L (2009) Effect of high intensity intermittent training on heart rate variability in prepubescent children. Eur J Appl Physiol 105:731-738. https://doi.org/10.1007/s00421-008-0955-8

Ideally, the names of all authors should be provided, but the usage of “et al” in long author lists will also be accepted:

Smith J, Jones M Jr, Houghton L et al (1999) Future of health insurance. N Engl J Med 965:325–329

Article by DOI

Slifka MK, Whitton JL (2000) Clinical implications of dysregulated cytokine production. J Mol Med. https://doi.org/10.1007/s001090000086

Book

South J, Blass B (2001) The future of modern genomics. Blackwell, London

Book chapter

Brown B, Aaron M (2001) The politics of nature. In: Smith J (ed) The rise of modern genomics, 3rd edn. Wiley, New York, pp 230-257

Online document

Cartwright J (2007) Big stars have weather too. IOP Publishing PhysicsWeb. http://physicsweb.org/articles/news/11/6/16/1. Accessed 26 June 2007

Dissertation

Trent JW (1975) Experimental acute renal failure. Dissertation, University of California

Always use the standard abbreviation of a journal's name according to the ISSN List of Title Word Abbreviations, see

ISSN.org LTWA

If you are unsure, please use the full journal title.

Authors preparing their manuscript in LaTeX can use the bibliography style file sn-basic.bst which is included in the Springer Nature Article Template.

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Tables

All tables are to be numbered using Arabic numerals.

Tables should always be cited in text in consecutive numerical order.

For each table, please supply a table caption (title) explaining the components of the table.

Identify any previously published material by giving the original source in the form of a reference at the end of the table caption.

Footnotes to tables should be indicated by superscript lower-case letters (or asterisks for significance values and other statistical data) and included beneath the table body.

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Artwork and Illustrations Guidelines

Electronic Figure Submission

Supply all figures electronically.

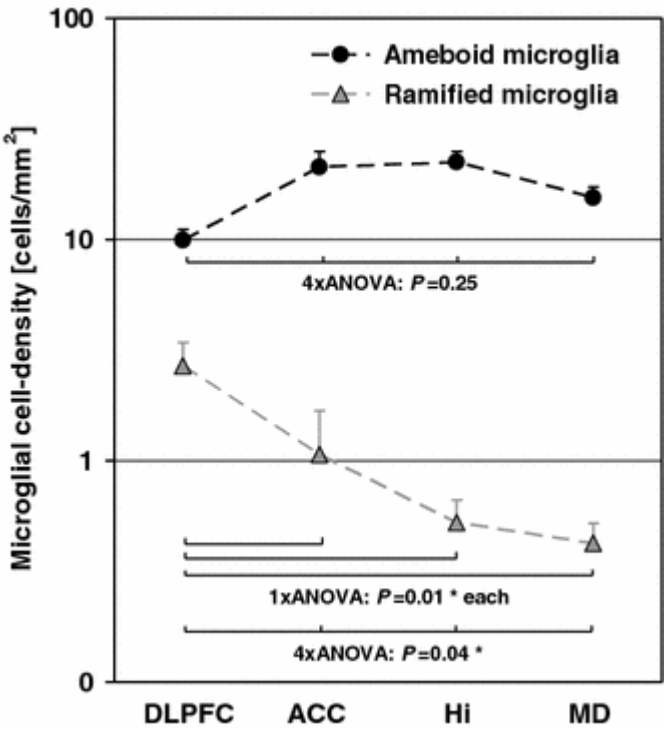
Indicate what graphics program was used to create the artwork.

For vector graphics, the preferred format is EPS; for halftones, please use TIFF format. MS Office files are also acceptable.

Vector graphics containing fonts must have the fonts embedded in the files.

Name your figure files with "Fig" and the figure number, e.g., Fig1.eps.

Line Art



Definition: Black and white graphic with no shading.

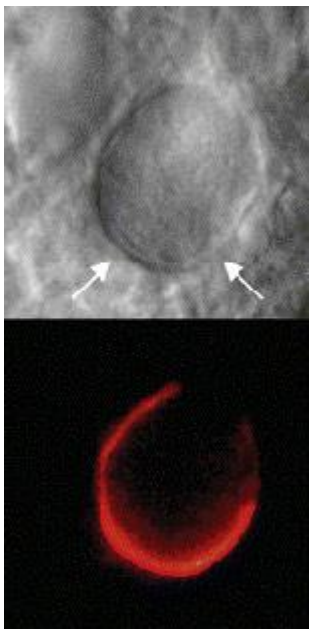
Do not use faint lines and/or lettering and check that all lines and lettering within the figures are legible at final size.

All lines should be at least 0.1 mm (0.3 pt) wide.

Scanned line drawings and line drawings in bitmap format should have a minimum resolution of 1200 dpi.

Vector graphics containing fonts must have the fonts embedded in the files.

Halftone Art

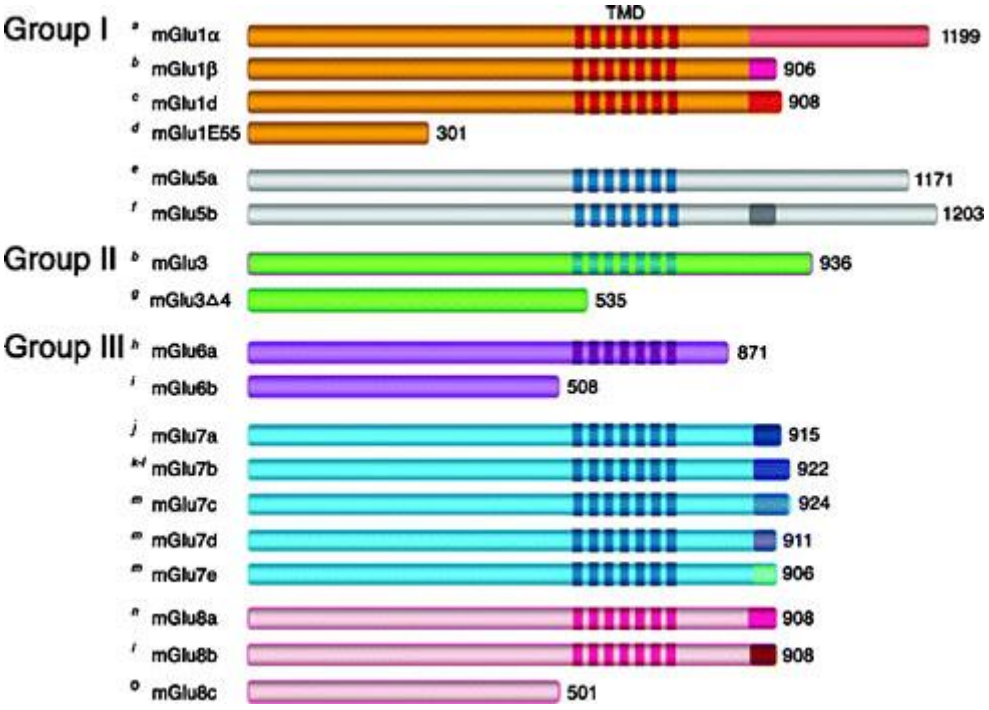


Definition: Photographs, drawings, or paintings with fine shading, etc.

If any magnification is used in the photographs, indicate this by using scale bars within the figures themselves.

Halftones should have a minimum resolution of 300 dpi.

Combination Art



Definition: a combination of halftone and line art, e.g., halftones containing line drawing, extensive lettering, color diagrams, etc.

Combination artwork should have a minimum resolution of 600 dpi.

Color Art

Color art is free of charge for print and online publication.

Color illustrations should be submitted as RGB.

Figure Lettering

To add lettering, it is best to use Helvetica or Arial (sans serif fonts).

Keep lettering consistently sized throughout your final-sized artwork, usually about 2–3 mm (8–12 pt).

Variance of type size within an illustration should be minimal, e.g., do not use 8-pt type on an axis and 20-pt type for the axis label.

Avoid effects such as shading, outline letters, etc.

Do not include titles or captions within your illustrations.

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All figures are to be numbered using Arabic numerals.

Figures should always be cited in text in consecutive numerical order.

Figure parts should be denoted by lowercase letters (a, b, c, etc.).

If an appendix appears in your article and it contains one or more figures, continue the consecutive numbering of the main text. Do not number the appendix figures, "A1, A2, A3, etc." Figures in online appendices [Supplementary Information (SI)] should, however, be numbered separately.

Figure Captions

Each figure should have a concise caption describing accurately what the figure depicts. Include the captions in the text file of the manuscript, not in the figure file.

Figure captions begin with the term Fig. in bold type, followed by the figure number, also in bold type.

No punctuation is to be included after the number, nor is any punctuation to be placed at the end of the caption.

Identify all elements found in the figure in the figure caption; and use boxes, circles, etc., as coordinate points in graphs.

Identify previously published material by giving the original source in the form of a reference citation at the end of the figure caption.

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Figures should be submitted within the body of the text. Only if the file size of the manuscript causes problems in uploading it, the large figures should be submitted separately from the text.

When preparing your figures, size figures to fit in the column width.

For large-sized journals the figures should be 84 mm (for double-column text areas), or 174 mm (for single-column text areas) wide and not higher than 234 mm.

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Maximum file size: 25 GB for high resolution files; 5 GB for low resolution files

Minimum video duration: 1 sec

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Text and Presentations

Submit your material in PDF format; .doc or .ppt files are not suitable for long-term viability.

A collection of figures may also be combined in a PDF file.

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Spreadsheets should be submitted as .csv or .xlsx files (MS Excel).

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It is possible to collect multiple files in a .zip or .gz file.

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If supplying any supplementary material, the text must make specific mention of the material as a citation, similar to that of figures and tables.

Refer to the supplementary files as “Online Resource”, e.g., "... as shown in the animation (Online Resource 3)", “... additional data are given in Online Resource 4”.

Name the files consecutively, e.g. “ESM_3.mpg”, “ESM_4.pdf”.

Captions

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See our list of mandated data types.

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The submitted work should be original and should not have been published elsewhere in any form or language (partially or in full), unless the new work concerns an expansion of previous work. (Please provide transparency on the re-use of material to avoid the concerns about text-recycling ('self-plagiarism').

A single study should not be split up into several parts to increase the quantity of submissions and submitted to various journals or to one journal over time (i.e. 'salami-slicing/publishing').

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unusual hazards in the use of chemicals, weaponization of research/technology (amongst others).

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Authors are welcome to suggest suitable reviewers and/or request the exclusion of certain individuals when they submit their manuscripts. When suggesting reviewers, authors should make sure they are totally independent and not connected to the work in any way. It is strongly recommended to suggest a mix of reviewers from different countries and different institutions. When suggesting reviewers, the Corresponding Author must provide an institutional email address for each suggested reviewer, or, if this is not possible to include other means of verifying the identity such as a link to a personal homepage, a link to the publication record or a researcher or author ID in the submission letter. Please note that the Journal may not use the suggestions, but suggestions are appreciated and may help facilitate the peer review process.

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Competing Interests

Authors are requested to disclose interests that are directly or indirectly related to the work submitted for publication. Interests within the last 3 years of beginning the work (conducting the research and preparing the work for submission) should be reported. Interests outside the 3-year time frame must be disclosed if they could reasonably be perceived as influencing the submitted work. Disclosure of interests provides a complete and transparent process and helps readers form their own judgments of potential bias. This is not meant to imply that a financial relationship with an organization that sponsored the research or compensation received for consultancy work is inappropriate.

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Please note that, in addition to the above requirements, funding information (given that funding is a potential competing interest (as mentioned above)) needs to be disclosed upon submission of the manuscript in the peer review system. This information will automatically be added to the Record of CrossMark, however it is **not added** to the manuscript itself. Under 'summary of requirements' (see below) funding information should be included in the '**Declarations**' section.

Summary of requirements

The above should be summarized in a statement and placed in a 'Declarations' section before the reference list under a heading of 'Funding' and/or 'Competing interests'. Other declarations include Ethics approval, Consent, Data, Material and/or Code availability and Authors' contribution statements.

Please see the various examples of wording below and revise/customize the sample statements according to your own needs.

When all authors have the same (or no) conflicts and/or funding it is sufficient to use one blanket statement.

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Partial financial support was received from [...]

The research leading to these results received funding from [...] under Grant Agreement No[...].

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This work was supported by [...] (Grant numbers [...] and [...]

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No funding was received for conducting this study.

No funds, grants, or other support was received.

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Research involving human participants, their data or biological material

Ethics approval

When reporting a study that involved human participants, their data or biological material, authors should include a statement that confirms that the study was approved (or granted exemption) by the appropriate institutional and/or national research ethics committee (including the name of the ethics committee) and certify that the study was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. If doubt exists whether the research was conducted in accordance with the 1964 Helsinki Declaration or comparable standards, the authors must explain the reasons for their approach, and demonstrate that an independent ethics committee or institutional review board explicitly approved the doubtful aspects of the study. If a study was granted exemption from requiring ethics approval, this should also be detailed in the manuscript (including the reasons for the exemption).

Retrospective ethics approval

If a study has not been granted ethics committee approval prior to commencing, retrospective ethics approval usually cannot be obtained and it may not be possible to consider the manuscript for peer review. The decision on whether to proceed to peer review in such cases is at the Editor's discretion.

Ethics approval for retrospective studies

Although retrospective studies are conducted on already available data or biological material (for which formal consent may not be needed or is difficult to obtain) ethics approval may be required dependent on the law and the national ethical guidelines of a country. Authors should check with their institution to make sure they are complying with the specific requirements of their country.

Ethics approval for case studies

Case reports require ethics approval. Most institutions will have specific policies on this subject. Authors should check with their institution to make sure they are complying with the specific requirements of their institution and seek ethics approval where needed. Authors should be aware to secure informed consent from the individual (or parent or guardian if the participant is a minor or incapable) See also section on **Informed Consent**.

Cell lines

If human cells are used, authors must declare in the manuscript: what cell lines were used by describing the source of the cell line, including when and from where it was obtained, whether

the cell line has recently been authenticated and by what method. If cells were bought from a life science company the following need to be given in the manuscript: name of company (that provided the cells), cell type, number of cell line, and batch of cells.

It is recommended that authors check the NCBI database for misidentification and contamination of human cell lines. This step will alert authors to possible problems with the cell line and may save considerable time and effort.

Further information is available from the International Cell Line Authentication Committee (ICLAC).

Authors should include a statement that confirms that an institutional or independent ethics committee (including the name of the ethics committee) approved the study and that informed consent was obtained from the donor or next of kin.

Research Resource Identifiers (RRID)

Research Resource Identifiers (RRID) are persistent unique identifiers (effectively similar to a DOI) for research resources. This journal encourages authors to adopt RRIDs when reporting key biological resources (antibodies, cell lines, model organisms and tools) in their manuscripts.

Examples:

Organism: *Filip1*$^{tm1a(KOMP)Wtsi}$ **RRID:MMRRC_055641-UCD**

Cell Line: RST307 cell line **RRID:CVCL_C321**

Antibody: Luciferase antibody DSHB Cat# LUC-3, **RRID:AB_2722109**

Plasmid: mRuby3 plasmid **RRID:Addgene_104005**

Software: ImageJ Version 1.2.4 **RRID:SCR_003070**

RRIDs are provided by the Resource Identification Portal. Many commonly used research resources already have designated RRIDs. The portal also provides authors links so that they can quickly register a new resource and obtain an RRID.

Clinical Trial Registration

The World Health Organization (WHO) definition of a clinical trial is "any research study that prospectively assigns human participants or groups of humans to one or more health-related interventions to evaluate the effects on health outcomes". The WHO defines health interventions as “A health intervention is an act performed for, with or on behalf of a person or population whose purpose is to assess, improve, maintain, promote or modify health,

functioning or health conditions" and a health-related outcome is generally defined as a change in the health of a person or population as a result of an intervention.

To ensure the integrity of the reporting of patient-centered trials, authors must register prospective clinical trials (phase II to IV trials) in suitable publicly available repositories. For example www.clinicaltrials.gov or any of the primary registries that participate in the WHO International Clinical Trials Registry Platform.

The trial registration number (TRN) and date of registration should be included as the last line of the manuscript abstract.

For clinical trials that have not been registered prospectively, authors are encouraged to register retrospectively to ensure the complete publication of all results. The trial registration number (TRN), date of registration and the words 'retrospectively registered' should be included as the last line of the manuscript abstract.

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Exact requirements may vary depending on the journal; please refer to the journal's Instructions for Authors.

Checklists are available for a number of study designs, including:

Randomised trials (CONSORT) and Study protocols (SPIRIT)

Observational studies (STROBE)

Systematic reviews and meta-analyses (PRISMA) and protocols (Prisma-P)

Diagnostic/prognostic studies (STARD) and (TRIPOD)

Case reports (CARE)

Clinical practice guidelines (AGREE) and (RIGHT)

Qualitative research (SRQR) and (COREQ)

Animal pre-clinical studies (ARRIVE)

Quality improvement studies (SQUIRE)

Economic evaluations (CHEERS)

Summary of requirements

The above should be summarized in a statement and placed in a 'Declarations' section before the reference list under a heading of 'Ethics approval'.

Examples of statements to be used when ethics approval has been obtained:

• All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The study was approved by the Bioethics Committee of the Medical University of A (No. ...).

• This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of University B (Date.../No. ...).

• Approval was obtained from the ethics committee of University C. The procedures used in this study adhere to the tenets of the Declaration of Helsinki.

• The questionnaire and methodology for this study was approved by the Human Research Ethics committee of the University of D (Ethics approval number: ...).

Examples of statements to be used for a retrospective study:

• Ethical approval was waived by the local Ethics Committee of University A in view of the retrospective nature of the study and all the procedures being performed were part of the routine care.

• This research study was conducted retrospectively from data obtained for clinical purposes. We consulted extensively with the IRB of XYZ who determined that our study did not need ethical approval. An IRB official waiver of ethical approval was granted from the IRB of XYZ.

• This retrospective chart review study involving human participants was in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The Human Investigation Committee (IRB) of University B approved this study.

Examples of statements to be used when no ethical approval is required/exemption granted:

• This is an observational study. The XYZ Research Ethics Committee has confirmed that no ethical approval is required.

• The data reproduced from Article X utilized human tissue that was procured via our Biobank AB, which provides de-identified samples. This study was reviewed and deemed exempt by our XYZ Institutional Review Board. The BioBank protocols are in accordance with the ethical standards of our institution and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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Informed consent

All individuals have individual rights that are not to be infringed. Individual participants in studies have, for example, the right to decide what happens to the (identifiable) personal data gathered, to what they have said during a study or an interview, as well as to any photograph that was taken. This is especially true concerning images of vulnerable people (e.g. minors, patients, refugees, etc) or the use of images in sensitive contexts. In many instances authors will need to secure written consent before including images.

Identifying details (names, dates of birth, identity numbers, biometrical characteristics (such as facial features, fingerprint, writing style, voice pattern, DNA or other distinguishing characteristic) and other information) of the participants that were studied should not be published in written descriptions, photographs, and genetic profiles unless the information is essential for scholarly purposes and the participant (or parent/guardian if the participant is a minor or incapable or legal representative) gave written informed consent for publication. Complete anonymity is difficult to achieve in some cases. Detailed descriptions of individual participants, whether of their whole bodies or of body sections, may lead to disclosure of their identity. Under certain circumstances consent is not required as long as information is anonymized and the submission does not include images that may identify the person.

Informed consent for publication should be obtained if there is any doubt. For example, masking the eye region in photographs of participants is inadequate protection of anonymity. If identifying characteristics are altered to protect anonymity, such as in genetic profiles, authors should provide assurance that alterations do not distort meaning.

Exceptions where it is not necessary to obtain consent:

• Images such as x rays, laparoscopic images, ultrasound images, brain scans, pathology slides unless there is a concern about identifying information in which case, authors should ensure that consent is obtained.

• Reuse of images: If images are being reused from prior publications, the Publisher will assume that the prior publication obtained the relevant information regarding consent. Authors should provide the appropriate attribution for republished images.

Consent and already available data and/or biologic material

Regardless of whether material is collected from living or dead patients, they (family or guardian if the deceased has not made a pre-mortem decision) must have given prior written consent. The aspect of confidentiality as well as any wishes from the deceased should be respected.

Data protection, confidentiality and privacy

When biological material is donated for or data is generated as part of a research project authors should ensure, as part of the informed consent procedure, that the participants are made aware what kind of (personal) data will be processed, how it will be used and for what purpose. In case of data acquired via a biobank/biorepository, it is possible they apply a broad consent which allows research participants to consent to a broad range of uses of their data and samples which is regarded by research ethics committees as specific enough to be considered “informed”. However, authors should always check the specific biobank/biorepository policies or any other type of data provider policies (in case of non-bio research) to be sure that this is the case.

Consent to Participate

For all research involving human subjects, freely-given, informed consent to participate in the study must be obtained from participants (or their parent or legal guardian in the case of children under 16) and a statement to this effect should appear in the manuscript. In the case of articles describing human transplantation studies, authors must include a statement declaring that no organs/tissues were obtained from prisoners and must also name the institution(s)/clinic(s)/department(s) via which organs/tissues were obtained. For manuscripts reporting studies involving vulnerable groups where there is the potential for coercion or where consent may not have been fully informed, extra care will be taken by the editor and may be referred to the Springer Nature Research Integrity Group.

Consent to Publish

Individuals may consent to participate in a study, but object to having their data published in a journal article. Authors should make sure to also seek consent from individuals to publish their data prior to submitting their paper to a journal. This is in particular applicable to case studies. A consent to publish form can be found

here. (Download docx, 36 kB)

Summary of requirements

The above should be summarized in a statement and placed in a 'Declarations' section before the reference list under a heading of 'Consent to participate' and/or 'Consent to publish'. Other declarations include Funding, Competing interests, Ethics approval, Consent, Data and/or Code availability and Authors' contribution statements.

Please see the various examples of wording below and revise/customize the sample statements according to your own needs.

Sample statements for **"Consent to participate"**:

Informed consent was obtained from all individual participants included in the study.

Informed consent was obtained from legal guardians.

Written informed consent was obtained from the parents.

Verbal informed consent was obtained prior to the interview.

Sample statements for **"Consent to publish"**:

The authors affirm that human research participants provided informed consent for publication of the images in Figure(s) 1a, 1b and 1c.

The participant has consented to the submission of the case report to the journal.

Patients signed informed consent regarding publishing their data and photographs.

Sample statements if identifying information about participants is available in the article:

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Images will be removed from publication if authors have not obtained informed consent or the paper may be removed and replaced with a notice explaining the reason for removal.

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ICMJE, Defining the Role of Authors and Contributors,

Transparency in authors' contributions and responsibilities to promote integrity in scientific publication, McNutt at all, PNAS February 27, 2018

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All authors are requested to include information regarding sources of funding, financial or non-financial interests, study-specific approval by the appropriate ethics committee for research

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Examples of such statement(s) are shown below:

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All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by [full name], [full name] and [full name]. The first draft of the manuscript was written by [full name] and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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A Graduate Student's Guide to Determining Authorship Credit and Authorship Order, APA Science Student Council 2006

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Appendix B - PRISMA Checklist

Section and Topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	Page 8
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	Page 9
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	Pages 12-13
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	Page 13
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	Pages 15-16
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	Page 15
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	Page 15
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	Page 16

Section and Topic	Item #	Checklist item	Location where item is reported
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	Page 16
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	Pages 15-16
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	Pages 15-16
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	Page 16
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	Pages 16-17
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	Pages 15-16
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	N/A
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	Pages 15-16
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	Pages 16-17
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	Page 17

Section and Topic	Item #	Checklist item	Location where item is reported
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	Page 16
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	Page 17
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	Page 16
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	Pages 17-18
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	Page 17
Study characteristics	17	Cite each included study and present its characteristics.	Pages 19-21
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	Pages 28-29
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	Pages 22-27
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	Pages 28-29
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	Pages 22-27
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	Pages

Section and Topic	Item #	Checklist item	Location where item is reported
			22-27
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	Pages 28-29
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	Pages 28-29
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	Pages 28-29
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	29-32
	23b	Discuss any limitations of the evidence included in the review.	29-32
	23c	Discuss any limitations of the review processes used.	29-32
	23d	Discuss implications of the results for practice, policy, and future research.	29-32
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	15
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	N/A
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	N/A
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	N/A
Competing interests	26	Declare any competing interests of review authors.	N/A

Section and Topic	Item #	Checklist item	Location where item is reported
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	N/A

Supplementary Materials

Narrative Summary of Self-Concept and Paranoia Relationship

What is the relationship between paranoia and self-esteem?

Overall, five studies examined the relationship between paranoia and self-esteem, measured by the RSES [40, 56, 58, 59, 60]. Two of these studies included the same participant sample [58, 59]. Three of the samples were from non-clinical populations, one included a clinical sample.

Pearson's correlational analysis was reported for three of these studies. A negative relationship was reported between paranoia and high self-esteem, the strength of these were medium in a clinical and non-clinical sample (r = -0.43- 0.46) [40, 60] and small in a non-clinical sample (r = -.227) [59].

The study by Bird et al. [40] used a longitudinal design where the strength of this relationship remained medium at follow-up, indicating low self-esteem can predict paranoia persistence. Whereas, in the study by Wong et al. [60] a regression analysis was conducted, indicating a significant relationship between paranoia and low self-esteem in a UK sample (OR = 2.16 – 2.86) and Hong Kong sample (OR = 1.58 - 3.76) [60].

Furthermore, one study considered whether self-esteem was a mediating factor for paranoia and happiness [56]. The relationship between happiness and paranoia was partially mediated by self-esteem. Therefore, if self-esteem was high, low happiness did not predict paranoia. A longitudinal mediation study found that paranoia reduced wellbeing through negative self-esteem [58]. Finally, an RCT by Parker and Kingston [59] (2022) found paranoia reduced following a values-based intervention. However, there was not a significant difference in the groups self-esteem over time.

What is the relationship between paranoia and core beliefs?

The BCSS was used to measure negative beliefs about self and other, to explore its relationship with paranoia in three studies [40, 55, 57]. The studies included two clinical populations and one non-clinical [55].

All three studies conducted correlational analyses and reported an association between paranoia and negative core beliefs about the self. The strength of the correlations ranged from small in a clinical sample (r =0.26) [57] to medium in a clinical and non-clinical sample (r =0.51-0.57) [40, 55]. A significant small negative correlation was between paranoia and positive beliefs

about the self in a non-clinical sample (r =-0.32) [55] but not in another clinical sample (r = -0.06) [57].

The study by Gin et al. [57] developed a model to test the associations between components of the adult cognitive model of psychosis including negative self-beliefs. They found these beliefs contributed significantly to paranoia (β =0.14, p<.05). Furthermore, Galbraith et al. [55] considered whether negative core beliefs was a mediating factor for paranoia and hallucinations, but this was not found.

What is the relationship between paranoia and self-criticising and post trauma beliefs?

Two final studies both used the paranoia scale to consider the relationship between paranoia and self-evaluations/beliefs in non-clinical populations. The Forms of Self-Criticising/Attacking and Self-Reassurance Scale (FSCRS) was used by Carvalho et al. [54] including subscales for positive and negative self-evaluations. The Post-traumatic Cognitions Inventory (PTCI) used by Campbell and Morrison [53] considered beliefs about the self, following traumatic experiences.

A medium relationship was found between persecutory ideas/mistrust feelings and self-criticising/attacking beliefs (r = .39-.54) [54]. Additionally, post-trauma negative/self-blaming beliefs and paranoia were associated with medium strength (r = .62) [52]. Significant negative correlations were additionally found for self-reassurance and persecutory ideas, with a small effect (r =-.29) [54]. However, the relationship for self-reassurance and mistrust feelings had no effect (r =-.14). Regression analysis was conducted in both papers, indicating self-criticism [54] and post-trauma negative self-beliefs [53] predicted paranoia.

Chapter 2 Young Adults' Thoughts and Feelings About Other People Over Time

This chapter has been prepared for the submission to the Journal of Contextual Behavioral Science, please see appendix A for journal guidelines.

Young Adults Thoughts and Feeling About Other People Over Time

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Abstract

Background: Evidence suggests negative-self and -other beliefs predict the persistence of paranoia. We require greater understanding of what factors moderate this relationship. At present there are no studies exploring the influence of psychological flexibility (cognitive defusion, mindfulness and values) on paranoia and self and other beliefs. The current study tested a moderation model, to explore whether the relationship between negative-self and -other beliefs and paranoia is moderated by psychological flexibility. **Method:** A longitudinal design was used, involving participants (n=127) completing questionnaires at two time points: Time 1 (T1; baseline) and Time 2 (T2; 4 weeks later). A moderation analysis was used to measure the relationship between negative-self and -other beliefs (IV), paranoia (DV), and psychological flexibility (cognitive defusion, mindfulness and values; moderators). **Results:** Significant relationships, with small to medium effects (r=.205-.523), were reported between negative-self and -other beliefs, paranoia, and psychological flexibility. Cognitive defusion, mindfulness and negative-other beliefs at T1 predicted paranoia at T2. The relationship between negative beliefs about self and others and paranoia was not moderated by psychological (in)flexibility. **Conclusions:** Although significant relationships were found between variables, the moderation model was not supported. Future research is needed to understand the mechanisms that might moderate the effect of these beliefs on paranoia.

Keywords: Paranoia, Self and Other Beliefs, Psychological Flexibility

Introduction

Paranoia is the belief that others are trying to or intend to cause you harm (Freeman & Garety, 2000). In a non-clinical sample 20 to 30% of adolescent's reported experiencing several paranoid thoughts at least weekly. Additionally, 17% of participants experienced 'mildly elevated levels' of paranoia, with less adolescents reporting moderate, high, and severe levels of paranoia (Bird, 2020). This body of evidence supports continuum models of paranoia (Strauss, 1969; Elhani et al., 2017), with milder experiences more widely reported in the general population and at the extreme end severe paranoia, representing persecutory delusions reported in clinical populations (Bebbington et al., 2013; Hajdúk et al., 2019). It is often associated with psychosis as it is a key symptom (NICE, 2021) but it is not exclusive to psychosis, reported in other mental health presentations such as depression, anxiety, and PTSD (Bird, 2020). Therefore, given how widely paranoia is experienced it is important we measure it in different populations including different age groups and both clinical and non-clinical groups.

Understanding paranoia is a priority due to the impact it can have on the individual, their support system and wider society. For some, experiences of paranoia are manageable, however for others it can be debilitating and when left untreated or unsupported can become more debilitating and less manageable (Jabar et al., 2021). Paranoia can cause difficulty in daily functioning such as sleeping, working, and social functioning resulting in social isolation and distress (Freeman & Garety, 2014; Harper & Timmons, 2021). These consequences of paranoia make every day living a challenge for individuals and threaten their quality of life. Paranoia has also been associated with suicidal ideation, post-traumatic stress disorder, substance use, poor physical health, and increased health service use (Freeman et al., 2011).

Factors that have contributed to the onset, maintenance and severity of paranoia based on existing theoretical models (Freeman et al., 2016; Garety et al., 2001; Morrison., 2001), include worry (Saarinen et al., 2022; Sheffield et al., 2021), negative-self beliefs (Humphrey et al., 2021; Sheffield et al., 2021), negative-other beliefs (Humphrey et al., 2021), sleep disturbance (Sheffield et al., 2021; Waite et al., 2020), stress (Saarinen et al., 2022), social detachment (Saarinen et al., 2022), attachment insecurity (Lavin et al., 2020), cannabis use (Carlyle et al., 2021), childhood trauma (Carlyle et al., 2021), and depression (Mortiz et al., 2017). Cognitive models have identified that the presence of negative-self and -other beliefs increases an individual's risk of developing paranoia (Freeman et al., 2002) and is recognised as an influential mechanism when formulating experiences of psychosis (Freeman et al., 2016; Garety et al., 2001; Morrison, 2001). A positive relationship between paranoia and negative-self and -other beliefs is supported by three systematic reviews (Humphrey et al., 2021; Kesting & Lincoln, 2013; Tiernan et al., 2014), reporting small (r = .36) to moderate (.56) effect sizes. The

effect size was not significantly different for clinical and non-clinical samples, providing additional support for the paranoia continuum theory. Furthermore, this relationship appears specific for paranoia, with only paranoid ideation and not grandiosity having a relationship with negative-self beliefs (Sheffield et al., 2021). To identify the temporal direction of these relationships, two longitudinal studies found negative-self and -other beliefs temporarily predicted the persistence of persecutory delusions (Fowler et al., 2012; Vorontsova et al., 2013). This pathway was not supported in the reverse direction; therefore, paranoia did not temporally predict negative-self and -other beliefs. These findings suggest negative-self and -other beliefs contribute to the maintenance of paranoia. The systematic reviews suggested future studies should consider using longitudinal designs to strengthen our understanding of the direction of these effects.

It is important to understand the mechanisms that might moderate the effect of negative-self and -other beliefs on paranoia. An existing factor identified in the development and maintenance of paranoia is the cognitive process of jumping to conclusions (Garety et al., 2005; Garety et al., 2015). In a sample of individuals with psychosis, the jumping to conclusions bias is high in those with high paranoia, and those with stronger negative-self and -other beliefs, compared to those with low paranoia and negative-self and -other beliefs (Garety et al., 2005). Therefore, when an individual is more likely to jump to conclusions, they may also be relying on their beliefs and relying on minimal evidence that confirms these beliefs. This concept conceptually links to psychological flexibility, where individuals with low psychological flexibility struggle to engage with their thoughts, being present, open, and doing what matters, and perhaps therefore are more likely to jump to conclusions. Therefore, psychological flexibility has been proposed as a putative moderator of negative-self and -other beliefs and paranoia because it influences how an individual relates to, and interacts with, their thoughts (Doorley et al., 2020). Psychological flexibility is at the centre of the Acceptance and Commitment Therapy (ACT) model, used in the treatment of a range of mental health conditions including psychosis, focusing on building this flexibility (Doorley et al., 2020). The ACT triflex model suggests psychological flexibility has three core processes, including be present, open up, and do what matters. Be present involves being aware of the present moment, without judgement and identifying the difference between the self and thoughts. Open up involves seeing thoughts and feelings for just thoughts and feelings, without avoiding or getting tangled up with them. Do what matters, involves identifying what is important and making decisions to move towards these. This flexibility is widely addressed across therapeutic models (Bonyadi et al., 2023; Yasinski et al., 2020).

The relationship between some components of psychological flexibility, paranoia, and negative-self and -other beliefs have been explored. Oliver et al. (2012) used a longitudinal

design to examine whether experiential avoidance, an element of psychological flexibility, was a moderator of negative mood (which was itself proposed as a mediating variable between negative-self and -other beliefs on the one hand, and delusional thinking on the other). Their findings were supported, suggesting that young adults with negative-self and -other beliefs may be protected from experiencing delusional thinking due to lower experiential avoidance. The Acceptance and Action Questionnaire II (AAQ; Bond et al., 2011) was used to measure psychological flexibility, which includes questions exploring experiential avoidance. However, within the ACT model, psychological flexibility has other components for example cognitive defusion, mindfulness, and value committed action, and these individual elements were not all captured within the AAQ (Doorley et al., 2020). Relationships have been reported between paranoia and low levels of mindfulness (Kingston et al., 2019), early maladaptive schemas and low levels of mindfulness (Thimm, 2017) and positive self-evaluative beliefs and valued actions (Iacobucci et al., 2012). At present there are no longitudinal studies examining whether psychological flexibility (with this including aspects of all three dimensions) prospectively predicts paranoia. This is the first study exploring the separate elements of psychological flexibility and its relationship with paranoia and negative-self and -other beliefs. We require greater understanding of how negative-self and -other beliefs are related to paranoia. Psychological flexibility might moderate the association, because although an individual may hold a negative belief about themselves or others, if they have high psychological flexibility they may be able to recognise this negative belief, identify it as a thought without judgment and choose to act in line with their values, potentially reducing the risk of increasing paranoia. Whereas low psychological flexibility, suggests an individual would become tangled with or avoidant of the thoughts that come with these negative-self beliefs, reacting to them rather than acting in line with values, potentially this increasing paranoia. Therefore, the level of psychological flexibility and ability to use the skill in the current context may potentiate the strength of the association between negative-self beliefs and paranoia. The current study aimed to extend the literature, by examining the impact of psychological flexibility, specifically cognitive fusion, mindfulness, and values, on the relationship between negative-self and -other beliefs and paranoia. One hypothesis is that there will be baseline relationships between the elements of psychological flexibility, paranoia, and negative-self and -other beliefs. Our main hypothesis is that the strength of the prospective associations between negative-self and -other beliefs and paranoia are moderated by psychological flexibility at T1, such that the positive relationship is stronger when psychological flexibility is low. Therefore, psychological flexibility would moderate the relationship of each of negative-self and -other beliefs with paranoia.

Method

Design

The study used a longitudinal design, with participants completing the same questionnaires at two time points: Time 1 (T1; baseline) and Time 2 (T2; 4 weeks later). The independent variables were negative-self and -other beliefs, and the dependent variable was paranoia. The moderators were cognitive defusion, mindfulness and values.

Participants

To determine the number of participants required, G*Power analysis was conducted for moderation analysis (Faul et al., 2007). The recommended approach for determining power for moderation analysis is using a linear regression model, either F or T tests, both are recommended for the most conservative approach (Faul et al., 2009; Memon et al., 2019). Given that a medium effect size between negative-self and -other beliefs and paranoia was reported in the Oliver et al. (2012) study (r = .38), we expected a medium effect size, therefore estimated f as .15. Therefore, using the parameters of f^2= .15 (medium effect size), α = .05, power = .80, number of predictors = 2 (negative-self and other beliefs), 68 participants were required. For the t tests, using the parameters of a one tailed test, f^2= .15, α = .05, power = .80, number of predictors = 2, 43 participants were required. Therefore, at T1, the aim was for at least 79 participants to allow for at least 20% drop out. The original design changed due to the number of young adults participating within the timeframe required for the study, see Appendix C for this design. The reported design was chosen in consensus with the researchers and following exploration of the conceptual links and power required, prior to analysing any findings.

Measures

Revised Green Paranoid Thoughts Scale (R-GPTS; Freeman et al., 2021). The R-GPTS is an 18-item self-report measure of paranoia. It includes two subscales: part A ideas of reference (8 items) and part B ideas of persecution (10 items). The measure has a five-point scale, from zero (‘not at all’) to four (‘totally’), with the total score ranging between 0 and 72. It is appropriate for clinical and non-clinical populations, with higher scores indicating higher paranoia. A score of 11 on ideas of persecution (part B) suggest clinical levels of persecutory ideation, whereas scores of 18 or above suggest persecutory delusion. Previously the R-GPTS has demonstrated good internal consistency (α = >.80) (Williams et al., 2023), and moderate/strong construct validity, positively correlating with measures of psychosis (r = .23 - .56). In this sample, the

measure had excellent internal consistency overall (α = .92) and for ideas of persecution (α = .92), for ideas of refence this was good (α = .85).

The Brief Core Schema Scale (BCSS; Fowler et al., 2006). The BCSS has 24 items measuring beliefs about self and others, providing four subscales: Negative Self (NS), Negative Others (NO), Positive Self (PS), Positive Others (PO). In this study just the subscales NS (6 items) and NO (6 items) were used. It is a self-report measure, requiring a yes/no response to a statement e.g. 'I am weak' and if 'yes' followed by a rating of this belief on a four-point scale (1=slightly to 4=totally). The total score for the two subtests ranges between 0 and 48. The BCSS has been reported to have good internal consistency for NS (α = .86), NO (α = .87) and good construct validity, positively correlating with measures of self-evaluation (*r* = .23-.53) and self-schema (*r* = 0.15-0.49) (Fowler et al., 2006). The internal consistency for the current sample was good for the BCSS and NO subscale (α = .85), and satisfactory for the NS subscale (α = .79).

Cognitive Fusion Questionnaire (CFQ; Gillanders et al., 2014). The CFQ is a seven-item questionnaire that measures fusion to thoughts, within the triflex 'open up'. It has a seven-point scale, from one ('never true') to seven ('always true'), with the total score ranging between 0 and 49. Higher scores represent higher fusion with thoughts but for the purpose of this study, scores were reversed so higher scores represent defusion (less fused to thoughts). This allowed the results to be viewed clearly alongside mindfulness and values, with higher scores in all representing high psychological flexibility. The CFQ has previously demonstrated excellent internal consistency (α = .90) and good construct validity, positively correlating with measures of fusion, mindfulness, rumination, distress, and automatic thoughts (*r* = .26 - .87) (Gillanders et al., 2014). The internal consistency for this sample was excellent (α = .93).

Five Facet Mindfulness Questionnaire 15 Item (FFMQ-15; Baer et al., 2008). The FFMQ-15 measures five mindfulness skills: observing, describing, acting with awareness, nonjudging of internal experience, and nonreactivity to internal experience, within the triflex 'be present'. The 15 items are rated on a five-point scale, from one ('never or very rarely true') to five ('very often or always true'). The total score ranges between 15 and 75. A higher score on the FFMQ suggests a high level of mindfulness. This measure was used alongside the CFQ and VQ in considering psychological flexibility. The FFMQ-15 has had satisfactory/good internal consistency (α = 72 - .92) and good construct validity, positively correlating with measures of mindfulness (*r* = .32 - .56) (Baer et al., 2008). In this study, the internal consistency was satisfactory (α = .72).

Valuing Questionnaire (VQ; Smout et al., 2014). The VQ measures engagement in personal values, within the triflex 'do what matters'. There are 10 items, rated on a seven-point scale, from zero ('not at all true') to six (completely true). The minimum total score is 0 and the maximum total score is 60. Higher scores represent an individual who recognises what is

important to them and moves towards this. In a previous study, the measure was reported to have good internal consistency (α =.87 - .89) and good construct validity, positively correlating with measures of values, mindfulness, fusion, and distress (*r* = -.19 - .70) (Smout et al., 2014). From the current sample, the VQ demonstrated satisfactory internal consistency (α = .71).

Procedure

The study was approved by the Faculty Research Ethics Committee (FREC) at the University of Southampton (Ethics/ERGO Number: 88217). Participants either accessed the study via the student research participation page SONA for student credits, or via the link or QR code on the poster advertisement to be entered into a prize draw. Participants first read an information sheet and provided consent online. Participants then completed demographic questions, five standardised questionnaires (Revised Green Paranoid Thoughts Scale (R-GPTS; *Freeman et al., 2021*), The Brief Core Schema Scale (BCSS*; Fowler et al., 2006*), Cognitive Fusion Questionnaire (CFQ; *Gillanders et al., 2014*), Five Facet Mindfulness Questionnaire 15 Item (FFMQ-15; *Baer et al., 2008*) and Valuing Questionnaire (VQ; *Smout et al., 2014*)). The questionnaires were presented in the same order to all participants. Participants were invited to complete these five questionnaires, one more time, four weeks after their initial responses. Participants were made aware completion at all the time points was a requirement for student credits or to be entered into the prize draw. Attention checks were added to the end of two measures and participants data were removed if they did not respond with the correct responses. All participants were debriefed at the end of the study.

Statistical Analysis

Assumptions of normality and linearity were met, identified by measures of skewness, kurtosis, and visual inspection of plots (Field, 2018). Two outliers were identified by boxplots; however, this data was not removed or altered as they were deemed as true data points, therefore reflecting natural variance. Missing data was evident at T2, for participants who did not return to complete the second part. The steps taken to treat this involved determining whether this was missing at random or could be accounted for due to identifiable factors (Bennett, 2001). Comparisons were conducted in SPSS between 'completers' (those who returned for T2) and 'non-completers' (those who only participated at T1). This involved T-tests and Chi-Squared tests, exploring any differences between the groups for demographic factors (e.g., age, gender etc.) and baseline measures (e.g., T1 paranoia, T1 negative self-beliefs etc.). No differences were identified, suggesting the data was missing at random. Multiple imputation was considered, due to the missing data appearing random. However, it is not recommended to use this approach when more than 10% of the data is missing due to bias, as the missing data was

significant due to attrition, this method was not used (Lee & Huber, 2021). As this approach was not appropriate, analysis was run without manipulating the data.

Pearson correlation analyses were conducted, using SPSS 29.0 (IBM Corp, 2023), between all the standardised measures. The bivariate correlations between negative-self and -other beliefs, psychological flexibility (cognitive defusion, mindfulness and values) and paranoia were calculated to explore the strength of these relationships. The strength of associations were based on Cohen's effect sizes, small (0.2-0.3), medium (0.4-0.5), large (more than 0.8) (Cohen, 1988).

A moderation analysis was planned, using SPSS 29.0 (IBM Corp, 2023) to conduct linear regression models, to explore the main question. Checks were conducted for the normality of the distribution of the residuals for the regressions. The observed residuals were not normally distributed; therefore, log transformations were conducted for the variables which resulted in the assumption being met. The variables used in the models were: negative-self and other beliefs T1 (independent variables), cognitive defusion T1, mindfulness T1 and values T1 (moderators), paranoia T2 (dependant variable). Interaction terms were created by mean centring the independent variables and moderators and computing interactions between these variables. This allowed the moderators to be tested together within the model. Two separate models were conducted, the first exploring negative-self beliefs as the predictor and the second exploring negative-other beliefs as the predictor.

Results

Descriptive Statistics

At T1, 147 participants consented to participate; however, 17 participants did not complete the required questionnaires and three participants failed the attention checks. At T2, 66 participants returned and consented to participate. Eleven of these participants did not complete the questionnaire and three failed the attention checks. One participant who did not complete the questions at time one, completed these at T2 and therefore their data was added for T2 despite no data for T1. Therefore overall, there were 127 participants at T1 and 52 participants at T2.

Participant characteristics are provided in Table 1, including data for the full sample at T1, and broken down by completers and non-completers. Most of the sample were female, of white

ethnicity, and did not disclose a mental health diagnosis or neurodiversity. The age range of participants was 18 to 23 years old, with the total mean age (and standard deviation; *SD*) of 18.9 (1.22), for completers this was 18.9 (1.15) and non-completers this was 19 (1.28).

Table 1

Participant characteristics presented by those completing questionnaires at both time points (completers) and those who did not (non-completers).

Participant Characteristics		Total (*N*)	Completers (*N*)	Non-completers (*N*)
Number		127	52	75
Gender				
	Female	104	43	61
	Male	21	8	13
	Nonbinary	1	-	1
	Prefer not to say	1	1	-
Ethnicity				
	White	91	37	54
	Asian/Asian British/Asian American	16	7	9
	Black/African/Caribbean/African American/Black British	10	4	6
	Mixed/Multiple Ethnic Group	7	2	5
	Arab	1	1	-
	Prefer Not to Say	2	1	1
Diagnosis		39	15	24
	None	88	37	51
	Mental Health	57	20	24
	Neurodiversity	10	4	6
	Prefer not to say	3	2	1
Medication				
	No	94	2	-
	Yes	19	7	12
	Prefer not to say	14	6	8

Note. Neurodiversity including: ADHD and autism. Mental health difficulty including: depression, anxiety, anorexia nervosa, BPD, PTSD, EUPD, OCD. Medication included Fluoxetine, Mirtazapine, Sertraline and Duloxetine.

There were no differences between completers and non-completers in relation to demographic characteristics: age ($t(125) = -.09$, $p = .42$), gender ($X2(1, 127) = .04$, $p = .85$), ethnicity ($X2(1, 127) = .01$, $p = .92$), diagnosis ($X2(1, 127) = .14$, $p = .71$) or time one measure scores: paranoia reference $t(123) = -.86$, $p = .94$, paranoia persecution $t(123) = -.70$, $p = .84$, negative self-beliefs $t(123) = .85$, $p = .76$, negative other-beliefs $t(123) = .50$, $p = .48$, negative self and other beliefs $t(123) = .79$, $p = .75$, cognitive defusion $t(123) = .01$, $p = .17$, mindfulness $t(113) = .80$, $p = .15$ and values $t(121) = .54$, $p = .65$.

Table 2 provides the number of responses, means and standard deviations for all variables in the study.

Table 2

Means and Standard Deviations of Study Variables, Including at Time One and Time Two.

		Baseline		Time 2	
		n (missing)	*M (SD)*	*n (missing)*	*M (SD)*
Paranoia		125 (2)	18.02 (12.64)	51 (76)	16.90 (14)
	Reference		11.04 (6.13)		10.94 (7.66)
	Persecution		6.89 (7.91)		5.96 (7.36)
Negative Beliefs		125 (2)	7.15 (7.48)	51 (76)	7.80 (9.23)
	Self		3.02 (4.25)		3.63 (5.20)
	Other		4.13 (4.60)		4.18 (4.85)
Cognitive Defusion		125 (2)	26.05 (9.44)	51 (76)	27.84 (10.60)
Mindfulness		115 (12)	44.88 (7.30)	51 (76)	44.61 (7.72)
Values		123 (4)	34.60 (8.46)	51 (76)	34.47 (7.66)

Note. Fewer responses for mindfulness (FFMQ-15) and values (VQ) recorded due to a technical error on the system temporarily affecting the survey.

Associations Between Paranoia, Psychological Flexibility and Negative Self/Other Beliefs

Correlations between the variables in the study were conducted and are presented in Table 3. The majority of the correlations were statistically significant, and the effect sizes were medium between paranoia and negative-self and -other beliefs, paranoia and psychological flexibility, and negative-self and -others and psychological flexibility.

Table 3

Pearson correlation coefficients between measures at time one (n=125)

	Time 1 Mean (SD)	1	2	3	4	5	6	7	8	9
1. Paranoia Reference	11.04 (6.13)	1								
2. Paranoia Persecution	6.98 (7.91)	.612**	1							
3. Paranoia Reference and Persecution	18.02 (12.64)	.869**	.923**	1						
4. Negative Self Beliefs	3.02 (4.25)	.315**	.346**	.369**	1					
5. Negative Other Beliefs	4.13 (4.60)	.377**	.472**	.479**	.430**	1				
6. Negative Self and Other Beliefs	7.15 (7.48)	.411**	.486**	.504**	.832**	.859**	1			
7. Cognitive Defusion	26.05 (9.44)	-.433**	-.372**	-.443*	-.523**	-.333**	-.501**	1		
8. Mindfulness	44.88 (7.30)	-.390	-.358**	-.411**	-.437**	-.197*	-.365**	.588**	1	
9. Values	34.60 (8.46)	-.324**	-.205*	-.286**	-.393**	-.177	-.331**	.429**	.462**	1

Note. **Correlation is significant at the .01 level (2-tailed), *Correlation is significant at the .05 level (2-tailed).

Main Analysis: Moderation

Linear regressions, with interaction terms, were carried out to test whether the strength of the association between each of negative-self and -other beliefs on paranoia was moderated by psychological flexibility, see Table 4.

Table 4

Linear models for each of negative-self and negative-other beliefs at T1, moderated by psychological flexibility at T1, predicting paranoia at T2

	Model 1: Negative-Self -> Paranoia Model					**Model 2: Negative-Other -> Paranoia Model**			
	B	***SE B***	***t***	***p***		***B***	***SE B***	***t***	***p***
Constant	6.18	1.58	3.91	.001	Constant	5.44	1.23	4.42	<.001
Negative-Self	.28	.16	1.74	.091	Negative-Other	.31	.13	2.41	.021
Cognitive Defusion	-.89	.45	-1.98	.056	Cognitive Defusion	-1.14	.38	-2.97	.005
Mindfulness	-1.90	.96	-1.98	.055	Mindfulness	-1.16	.89	-1.30	.202
Values	-.53	.70	-.76	.454	Values	-.70	.62	-1.13	.267
Inter. Self & Defusion	.70	.93	-75	.457	Inter. Other & Defusion	.81	.89	.91	.371
Inter. Self & Mindfulness	3.21	1.88	1.70	.097	Inter. Other & Mindfulness	.00	.00	.20	.843
Inter. Self & Values	-.02	1.38	-.15	.880	Inter. Other & Values	-.08	.15	-.50	.621

Note. R^2 = .57-.61. Dependent variable: paranoia T2. Self: negative-self. Other: negative-other. Defusion: cognitive defusion. Inter.: interaction.

As seen in Table 4, there were main effects in the negative-other model. In the negative-other model, negative-other and cognitive defusion at T1 had a main effect on paranoia at T2. Negative other beliefs predict paranoia, stronger negative other beliefs predicts more paranoia (B = .31($SE\ B$ = .13), t = 2.41, p = .021), and cognitive defusion predicts paranoia, greater cognitive fusion predicts more paranoia (B = -1.41($SE\ B$ = .38), t = -2.97, p = .005). There were no main effects identified within the negative-self model and therefore no variables that affected paranoia at any level of negative self-beliefs or psychological flexibility. Finally, regarding our main hypothesis, there were no significant interactions between negative-self with a moderator at T1 or between negative-other and any moderators at T1, in prediction of paranoia at T2.

Discussion

The aim of the study was to examine, for the first time whether psychological flexibility moderated the temporal association between negative-self and negative-other beliefs and paranoia. We found significant relationships between paranoia, psychological flexibility, and negative-self and -other beliefs. Cognitive defusion and negative-other beliefs were found to be significant independent predictors of paranoia four weeks later. It was expected that psychological flexibility would moderate the relationship between negative-self and -other beliefs and paranoia, such that more flexibility would attenuate the strength of that relationship. The moderation effect was non-significant in both models (negative-self and negative-other beliefs). This could suggest there is no effect; however, it is also possible an effect does exist, but it was not detected in the analysis. One possible explanation for finding no moderation effects could be due to an under-powered analysis. A further explanation could be the limited frequency and time between measures, with only two time points four weeks apart, potentially not being long enough to observe effects. The ranges of scores and variation for psychological flexibility, negative-self and -other beliefs and paranoia at time two suggest good distribution of scores across constructs measures, potentially ruling out restriction of range as a possible explanation.

The findings have theoretical and clinical implications. The significant relationships between paranoia, psychological flexibility, and negative-self and -other beliefs is consistent with current literature, with significant support for paranoia and negative beliefs (Humphrey et al., 2021) and some initial indications of psychological flexibility having a relationship to these variables (Iacobucci et al., 2012; Kingston et al., 2019; Thimm, 2017). The findings in this study

have extended our understanding of the relationship of negative-self and -other beliefs and paranoia with psychological flexibility, demonstrating novelty by measuring aspects within each component of the triflex model for psychological flexibility. Furthermore, the main effects highlighted the importance of negative-other beliefs and cognitive defusion as variables affecting paranoia. Therefore, when considering the different components of psychological flexibility, cognitive defusion appears to be specifically important, because it prospectively predicted paranoia. The existing literature identifies jumping to conclusions as an influential factor in paranoia and cognitive defusion may fit into this process. Cognitive fusion involves being entangled with thoughts and therefore an individual may jump to conclusions of a paranoia nature based on treating these thoughts as facts and not seeking further explanations. Finally, these findings provide further support for cognitive models of psychosis, highlighting the importance of negative-self and -other beliefs in understanding paranoia in a non-clinical sample. Given the various potential explanations of no interaction effect, further exploration through longitudinal moderation designs is required before we would rule out psychological flexibility as a moderating variable between negative-self and -other beliefs and paranoia in a non-clinical sample. Clinical implications are limited at this stage; however, as cognitive fusion was found to be an independent prospective predictor of paranoia it may be beneficial to consider, following further research examining a possible casual relationship, whether cognitive fusion is appropriate to assess in young adults and include in psychological formulations identifying paranoia.

It is important to understand the mechanisms that might moderate the effect of negative-self and -other beliefs on paranoia. An existing factor identified in the development and maintenance of paranoia is the cognitive process of jumping to conclusions (Garety et al., 2005; Garety et al., 2015). The jumping to conclusions bias is high in individuals with paranoia, and individuals with stronger negative-self and -other beliefs are more likely to jump to conclusions, relying on their beliefs and relying on minimal evidence that confirms these beliefs (Garety et al., 2005). This concept conceptually links to psychological flexibility, where individuals with low psychological flexibility struggle to engage with their thoughts, being present, open, and doing what matters, and perhaps therefore are more likely to jump to conclusions. Therefore, psychological flexibility has been proposed as a putative moderator of negative-self and -other beliefs and paranoia because it influences how an individual relates to, and interacts with, their thoughts (Doorley et al., 2020).

It is important to consider the limitations of the study. Although the sample was adequate to obtain statistical power at T2 this was slightly below the threshold for power within the moderation design. Therefore, the results should be interpreted with caution. Additionally, the level of attrition is a concern that may introduce bias, as the reason for not returning to

complete the measures could be due to a characteristic such as age, gender, mental health difficulties. The sample is unrepresentative of the general population. Furthermore, sample size can impact the ability to detect an effect; therefore, the findings may be due to the small sample size. Although the comparisons between completers and non-completers conducted did not identify a pattern due to characteristics, the reason for this attrition remains unknown. Attrition is to be expected in longitudinal studies; and has varied greatly in other longitudinal studies in this area with attrition below 50% in the study by Oliver et al. (2012) and below 15% in the study by Fowler et al. (2012). The attrition in this study was closer to 60%. Furthermore, the sample was students mostly White British and females between the ages 18-23. Therefore, we are unable to generalise to other ethnicities, non-student community and clinical samples, male and other gender categories, or ages other than young adults. Although the study considered the different components of psychological flexibility, including measures capturing key aspects within the three areas: 'be present, open up, and do what matters', there are likely to be areas that require further detail. For example, within be present, the self as context is not represented in the measures used and values simplified into one measure does not include the complexity of this concept. A further limitation is that we did not measure other variables that are known to be important in relation to paranoia, such as low mood, anxiety or worry. Finally, the study only included two time points, four weeks apart from each other. Therefore, the limited time points and space between measures provided minimal opportunity to observe natural changes in the variables.

The findings highlight several important areas for future research. Further longitudinal studies re-addressing a moderation design within a clinical sample, with recruitment attempting to improve generalisability (such as recruiting in areas with greater ethnic diversity). Additionally, longitudinal designs measuring these variables over a longer period, capturing more than two time points would provide greater insight into changes and stability. Future research could include confounding variables, such as low mood, to consider the influence on the relationship between paranoia, negative-self and other beliefs, and the different components of psychological flexibility. Manipulation of these variables through experimental designs could also test for causal relationships between variables. This might be by improving psychological flexibility in a sample and comparing this with a control group to see the influence on negative-self and -other beliefs and paranoia. Given our understanding of the mechanisms of paranoia are influential in the assessment, treatment and prevention of paranoia further research is critical.

Conclusion

The current findings support a relationship between, negative-self and -other beliefs, psychological flexibility, and paranoia in young adults. Cognitive defusion and negative-other beliefs were found to be significant independent predictors of paranoia four weeks later. However, psychological flexibility was not supported as a moderator in this non-clinical sample. Although the moderation model was not supported, these findings should be interpreted cautiously and considered alongside existing research due to the implications of attrition addressed. Future research should seek to conduct longitudinal studies with longer follow up phases, as well as experimental designs to manipulate psychological flexibility and examine effects on paranoia. This could highlight factors to target in interventions to reduce or prevent paranoia.

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Appendix

Appendix A - Journal of Contextual Behavioral Science Submission Guidelines

Guide for authors

Types of article

All manuscripts must clearly and explicitly be of relevance to CBS. You may find the JCBS article "Report of the ACBS Task Force on the strategies and tactics of contextual behavioral science

research" helpful in assessing whether your manuscript is likely to be of interest to readers of this journal.

Articles should fall into one of six categories:
1. Empirical research (up to 6000 words)
2. Brief empirical reports (up to 3000 words)
3. Review articles (up to 10,000 words)
4. Conceptual articles (up to 6000 words)
5. Practical innovations (up to 6000 words)
6. Commentaries (up to 3000 words)
7. Registered reports (see instructions below)

Word limits exclude references, tables and figures but include the abstract

1. Empirical research. JCBS welcomes manuscripts across a breadth of domains from basic behavioral science to clinical trials. Potential methodologies include but are not limited to randomized controlled trials, single case experimental designs, cross-sectional and prospective cohort studies, mixed- methods designs, and laboratory-based studies. For randomized clinical trials, JCBS requires that submissions follow CONSORT guidelines. Papers reporting null findings are also welcome if their methodology is sound and their power sufficient.

2. Brief empirical reports. Manuscripts may report preliminary, provocative or replicated results. Empirically sound methodology and adequate power remain important considerations.

3. Review articles. Manuscripts reviewing a wide range of topics are encouraged as long as their content is directly relevant to CBS. Systematic reviews and meta-analyses are particularly welcome. For meta-analyses and systematic reviews, JCBS requires submissions follow PRISMA guidelines.

4. Conceptual articles. Manuscripts should address conceptual or theoretical issues relevant to CBS. This may include papers that discuss relevant philosophical assumptions and traditions, or conceptual papers which explore aspects of or inconsistencies in contextual behavioral theory and science.
5. Practical innovations. Manuscripts in this section share innovative and practically useful descriptions of applications of CBS to a given problem area based on real world implementation, with preliminary data supporting the innovation directly (preferred) or indirectly through relevant conceptual and empirical references. Submissions are evaluated based on the degree to which they 1) provide information that is directly useful to applied work, 2) provide innovative information (e.g., a novel protocol, population, issue), 3) are based on real world implementation/practice, and 4) are based on preliminary data reported in the manuscript, or a strong link to existing conceptual/empirical literature. Submissions that report empirical data should still primarily emphasize detailed descriptions of the intervention/training protocol

and/or of the applied relevance of the findings (e.g., clarifying and problem solving how to address an applied challenge identified in the study).

6. Commentaries. We will consider commentaries on other manuscripts that have been recently published in JCBS. Commentaries will be subjected to peer-review and will be held to the same standards of providing a notable contribution to our field to warrant publication. Authors will typically be informed when a commentary has been submitted on a manuscript they have published and will be given the opportunity to respond in print if the commentary is published. We encourage authors to contact the editor-in-chief prior to preparing a commentary to determine potential suitability for JCBS.

7. Registered reports. Registered Reports are a form of empirical article in which the methods and proposed analyses are pre-registered and reviewed by JCBS prior to research being conducted. This format is meant to encourage researchers to conduct research that is higher risk but addresses key issues or concerns of CBS in line with the Recommendations of the ACBS Task Force Report on the Strategies and Tactics of CBS Research. Further instructions on Registered Reports, including author guidelines and the submission process, can be downloaded here: JCBS Author Guidelines for Registered Reports.

The Journal welcomes suggestions for Special Issues. Proposals for a themed Special Issue should be sent to the Editor-in-Chief, Baljinder Sahdra at Baljinder.Sahdra@acu.edu.au, and should include suggested Guest Editors, a proposed call-for-papers, 6-10 example authors and topics that would fit the special issue, a proposed timeline for submission, peer-reviewing, revision and publication. All manuscripts in a special issue will be subject to the normal process of peer-review.

A special issue focuses on a specific area of research that has a broad appeal and falls within the aims and scope of the journal. The Guest Editor(s) handle the peer review process and the special issues should be reviewed by no fewer than two independent experts. The Editor(s) is responsible for the final decision regarding acceptance or rejection of articles.

Guest Editors are not involved in decisions about papers which they have written themselves or have been written by family members or colleagues or which relate to products or services in which the guest editor has an interest. Any such submission is subject to all of the journal's usual procedures, with peer review handled independently of the relevant editor and their research groups.

Contact details for submission

To contact the Editor-in-Chief prior to your submission with any questions, please email Baljinder.Sahdra@acu.edu.au

Submission checklist

You can use this list to carry out a final check of your submission before you send it to the journal for review.

Ensure that the following items are present:

One Cover Page (with author details; if has been designated as the corresponding author with contact details:

• E-mail address

• Full postal address

All necessary files have been uploaded:

Title Page (with author details):

•Include title, names, affiliations, contact information, acknowledgments, author note indicating a data sharing statement ("Data is available upon reasonable request") or study registration link to access data directly, and funding information.

Cover Page (with author details; if applicable):

Location of shared data and materials (if applicable)

Justifications for deviations to author guideline requirements (e.g., word length, data sharing author's note, etc)

Justifications for deviations to pre-registered analysis plan (if applicable)

Clarification if the manuscript is based on previously published data (i.e., secondary analysis)

Manuscript (without author details):

• Include keywords

• All identifying author information removed

• Pre-registration identifier and location of registration (e.g., Clinicaltrials.gov NCTXXXXXX)

•Include a statement on **both** ethical approval and informed consent for research involving human subjects

• All figures (include relevant captions)

• All tables (including titles, description, footnotes)

• Indicate clearly if color should be used for any figures in print

Highlights

Conflict of Interest: Authors who are on the Journal of Contextual Behavioral Science editorial board must include an editor statement acknowledging their role.

Response to Reviewers (without author details; for resubmissions)

Further considerations

Manuscript has been 'spell checked' and 'grammar checked'

Manuscripts should be prepared in APA style (7th edition)

Manuscripts should be prepared with the use of inclusive language (see "Use of inclusive language" section below)

All references mentioned in the Reference List are cited in the text, and vice versa

Permission has been obtained for use of copyrighted material from other sources (including the Internet)

Before you begin

Authors should prepare their manuscript for double anonymized review, so that only the handling editors have access to author details. Authors must take special care to delete all potentially identifying information from any files that are not the Title Page with author details and the Cover Letter. Note: these two documents are submitted separately to the main manuscript. Any potential author identifying information including, but not limited to, name(s), affiliation(s), geographic location(s), identifying acknowledgments, author notes or funding details, should be removed from all other files. In-text citations to previous work by the authors should be presented in such a way that it is not clear that it was written by the same authors or should be removed for masking with a note (e.g., "citation removed for anonymized review"). For authors resubmitting revisions of manuscripts, please ensure that the "Response to reviewers" is also free from author identifying information. Manuscripts that are not appropriately anonymized will be rejected without a full content review, although in many cases authors will be Study and Analysis Registration to re-submit manuscripts without author identifying information. This process will, however, delay review and manuscript processing times and should be avoided if at all possible.

Study and Analysis Registration

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Reference to software:

Coon, E., Berndt, M., Jan, A., Svyatsky, D., Atchley, A., Kikinzon, E., Harp, D., Manzini, G., Shelef, E., Lipnikov, K., Garimella, R., Xu, C., Moulton, D., Karra, S., Painter, S., Jafarov, E., & Molins, S. (2020, March 25). *Advanced Terrestrial Simulator (ATS) v0.88 (Version 0.88)*. Zenodo. https://doi.org/10.5281/zenodo.3727209.

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Reference to a journal publication with an article number:

Van der Geer, J., Hanraads, J. A. J., & Lupton, R. A. (2018). The art of writing a scientific article. *Heliyon*, *19*, e00205. https://doi.org/10.1016/j.heliyon.2018.e00205.

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Strunk, W., Jr., & White, E. B. (2000). *The elements of style.* (4th ed.). New York: Longman, (Chapter 4).

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Reference to a website:

Cancer Research UK. Cancer statistics reports for the UK. (2003). http://www.cancerresearchuk.org/aboutcancer/statistics/cancerstatsreport/ Accessed 13 March 2003.

Reference to a dataset:

[dataset] Oguro, M., Imahiro, S., Saito, S., Nakashizuka, T. (2015). *Mortality data for Japanese oak wilt disease and surrounding forest compositions*. Mendeley Data, v1. https://doi.org/10.17632/xwj98nb39r.1.

Reference to a conference paper or poster presentation:

Engle, E.K., Cash, T.F., & Jarry, J.L. (2009, November). The Body Image Behaviours Inventory-3: Development and validation of the Body Image Compulsive Actions and Body Image Avoidance Scales. Poster session presentation at the meeting of the Association for Behavioural and Cognitive Therapies, New York, NY.

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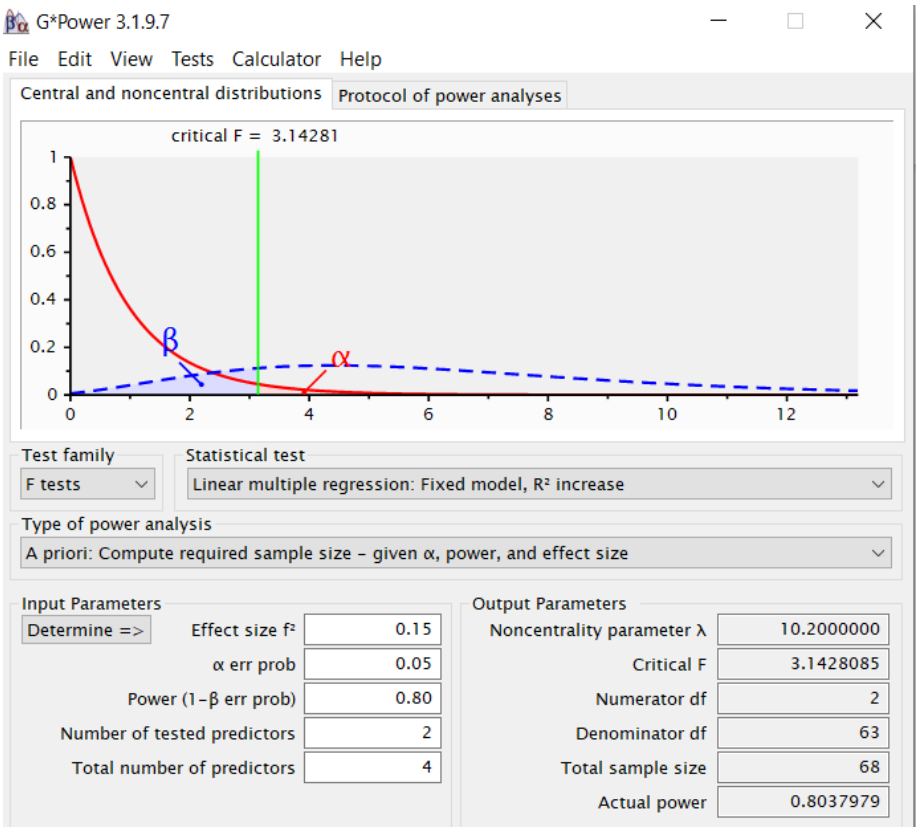
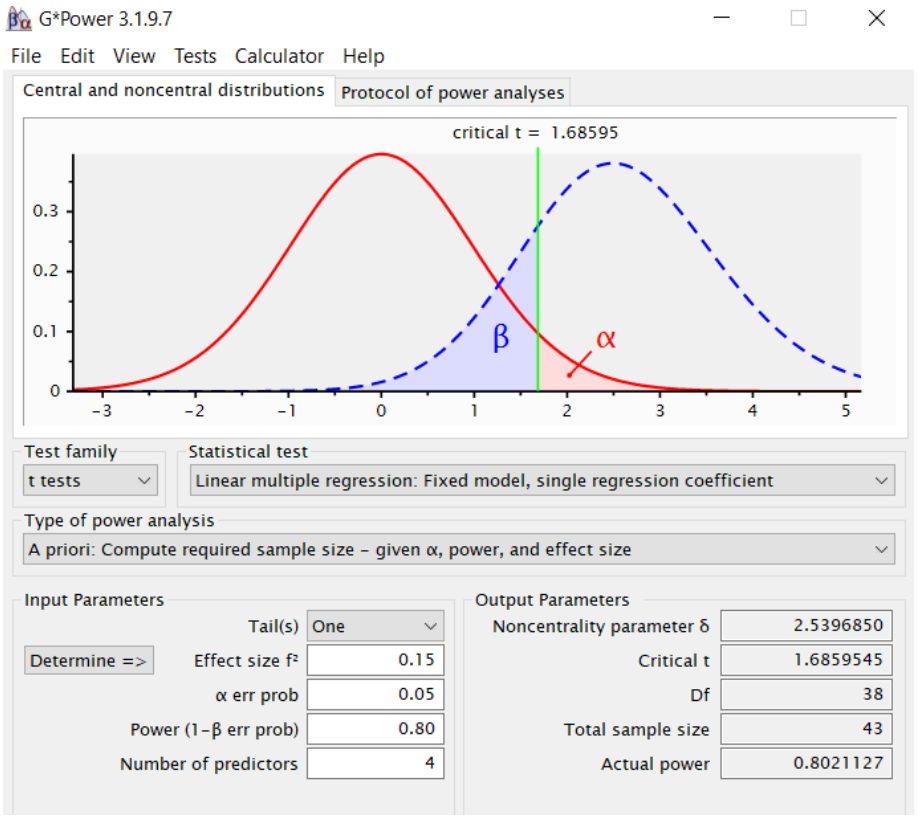
Appendix B - G Power Results





Appendix C - Original Design

The original design was to examine mediation, to determine whether psychological flexibility (cognitive fusion, mindfulness, and values) mediated beliefs about the self and others and paranoia. The Monte Carlo power analysis was used (Schoemann et al., 2017). With a power of .80 and *p*=.05 as recommended by Fritz & Mackinnon (2007), a sample of 122 participants was required, therefore including 20% for drop out 147 participants was the aim. Given the attrition, mediation analysis was no longer appropriate, and the design was changed to moderation.

Participants completed the same questionnaires at three time points: Time 1 (T1; baseline), Time 2 (T2; 4 weeks later), Time 3 (T3; 8 weeks later). However, in the paper only two time points were referred to. Data for T3 was not included in the analysis, due to just 25 participants returning to complete the final questionnaires.

Participants were made aware completion at all three time points was a requirement for student credits or to be entered into the prize draw.

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